

STATE OF MICHIGAN INVESTMENT BOARD MEETING

March 23, 2023

State of Michigan Retirement System
Quarterly Investment Review



Rachael Eubanks, State Treasurer
Prepared by Bureau of Investments
Michigan Department of Treasury

STATE OF MICHIGAN INVESTMENT BOARD MEETING

MARCH 23, 2023

Agenda



9:30 a.m. Call to Order and Opening Remarks

Approval of the 12/8/22 SMIB Meeting Minutes

Executive Summary & Performance for Periods Ending 12/31/22

9:50 a.m. Review of Investment Reports

- **Defined Contribution – Update**
- **Private Equity – Update**
- **Venture Capital – Update**
- **Real Estate & Infrastructure – Update**
- **Real Return & Opportunistic – Update**
- **Absolute Return – Update**
- **Fixed Income – Update**
- **Domestic Equity – Update**
- **International Equity – Update**

10:55 a.m. Public Comment

11:00 a.m. Closing Remarks ~ Adjournment



2023 Meeting Schedule

Thursday, June 29, 2023

Thursday, September 28, 2023

Wednesday, December 13, 2023

All meetings start at 9:30 a.m.

State of Michigan Retirement System

MINUTES

State of Michigan Investment Board Meeting

March 23, 2023



Jon M. Braeutigam
Chief Investment Officer
Bureau of Investments

STATE OF MICHIGAN INVESTMENT BOARD

December 8, 2022 Meeting Minutes

Board Members:

Chairman – Treasurer Rachael Eubanks – Absent
Acting Chairman, Mr. Chris Harkins – State Budget Director
Ms. Dina Richard
Mr. Reginald Sanders

Members of the Public and Bureau of Investments Staff in Attendance:

Robert Brackenbury	Jim Elkins	Dan Quigley
Karl Borgquist	Patrick Moraniec	Richard Holcomb
Greg Parker	Janet Sudac	Jack Behar

Many others attended via Microsoft Teams.

Opening Remarks:

Mr. Chris Harkins called the meeting to order at 9:30 am.

Approval of Minutes:

Approval of the September 22, 2022, SMIB Meeting Minutes – Motion to approve by Dina Richard.
Seconded: Reginald Sanders. The vote was unanimous to approve.

AGENDA

Executive Summary

Mr. Robert Brackenbury, Deputy Chief Investment Officer for the Bureau of Investments, reviewed the executive summary performance section discussing performance returns and markets. He called attention to the one-year figure of -4.4%. He stated it's been a long time since we have had a negative number in the one-year return. Last year at this time, a 28% return was reported. A year can make a big difference. We all know what happened this year; the rise in global inflation, the rise in interest rates, a rise in energy costs and the war in Ukraine has impacted all asset classes.

What hasn't changed is our relative return. Here, we have substantially beat not only our benchmarks but our peers across all time periods. We take great pride in this. There are a lot of smart people managing state pension funds across the country and any time you can beat the peer average return, that's not a bad place to be. Earning an average return level is considered to be doing very well when managing a state pension fund.

The SMRS invests for the long term, and that continues to be our focus. Our 10-year returns are exceptional on both an absolute and relative basis, and these longer-term returns add real compounded value to the pension funds. Over a very long horizon, since 1979, the annualized rate of return on the plan assets has been approximately 9.3%.

The focus for 2023 is to maintain liquidity and have capital available to pay beneficiaries, to pay capital commitments for our private market assets, and to implement the revised asset allocation plan that this board approved in September, evolving out of the most recent asset liability study for the pension funds. Questions from the Board were answered.

Asset Allocation Review, Markets Review and Outlook

Mr. Gregory Parker, Director of Investments – Public Markets reviewed the investment policy benchmark return. Over the past ten, seven, five, and three years, the plan policy was sufficient to earn the required rates of return. Mr. Parker noted that reviewing this past year, the overall annualized return was -4.4%, but the plan policy benchmark was designed to deliver -7.6%. The portfolio earned 3.2% above what the plan was designed to do. He pointed out that the 3.2% relative return this past year did have the longer time periods, estimating about half of the long-term outperformance of the plan was due to occurrences over this past year. Mr. Parker further discussed occurrences in the market over the past year that affected investment returns.

Mr. Parker then discussed interest rates and inflation. He presented a viewpoint that acknowledged the COVID-19 relief fiscal responses to support the economy were a once in a lifetime type event. The amount of support and stimulus that went into the system was massive and remains within the system. Mr. Parker believes that because of this, if there is a recession at all, it could be very mild. Questions from the Board were answered.

Fixed Income Update

Mr. Daniel Quigley, Senior Investment Manager for the Fixed Income Division (FID) presented a review of the Division. He stated that when constructing a fixed income portfolio there are four characteristics that are considered: income, liquidity, principal preservation, and diversification from equity market risk. He expressed that over the last eight years, since he has been manager, all of these characteristics have come into question. The main one of these being where to find the income.

The Fixed Income Division utilizes a core-plus portfolio strategy to achieve these goals. The core portion is interest rate driven, it is liquid, and it provides diversification. The plus portion is credit spread driven, high income/yield/coupon. Both core and plus suffered with interest rates increasing and credit spreads widening year-over-year. The FID has a yield of over 6.5% as of September 2022.

The FID performance reveals a very unusual negative number from a noteworthy period of time. The relative performance however, outperformed the index by 270 bps. The majority of that had to do with the interest rate position. The fixed income index only represents a small subset of the entire bond universe allowing more flexibility helping to drive long-term stability.

Mr. Quigley discussed the fixed income investment universe explaining the good news of the inverse relationship between price and yield. He stated that commercial mortgage-backed securities (CMBS) are at or near 10-year highs and that collateralized loan obligation (CLO) liabilities are at highs as well.

Regarding the FID portfolio positioning and CLO debt, Mr. Quigley noted that CLO's have strong credit protection and low interest rate risk. He explained CLO's at length. AAA CLO debt has 38% of credit enhancement, and BBB has over 11%. The Division has been investing in this space since 2015. He gave credit to Barb Becker who has been the primary manager for the CLO's purchased internally as well as handling all relationships. She is tasked with purchases of AAA/AA CLO's and attends multiple manager meetings, and has oversight over the externally managed strategy.

The FID investment themes were explained. These themes include reducing interest rate duration underweight, the current duration is 0.3 years below the benchmark. To maintain high conviction credit positions, and to preserve an allocation to liquid investments should continued market dislocations present themselves. Lastly, to maintain high conviction positions with partners while reducing low conviction bets and increasing liquidity where possible. Questions by the Board were answered.

Guest Speaker:

Mr. Jeffrey Moore, CFA – Fidelity Investments

Mr. Moore discussed the country's financial conditions mentioning interest rates, COVID-19 stimulus relief and what Chairman Powell looks for in making decisions.

He explained and described the current bond market activity and fixed income yields and spreads, as well as the interest rate environment and yield curve.

Mr. Moore showed a graph of the historical Treasury yields and explained that it is an excellent time to buy Treasury bonds. He does not believe, as so many do, that what happened in 2008 is about to come true and explained why.

He showed and explained the Fed funds target rate, market expectations and Fed projections and discussed that he believed rates would take another hike soon. Signs are being shown now that inflation is peaking. The Federal Reserve Policy was explained, and corporate spreads and credit quality was touched on. Several questions by the Board were answered.

Public Comment:

State of Michigan retiree, Mr. Aaron Wissner expressed his concerns regarding the pensioners' payments not keeping up with inflation.

Adjournment:

Motion to adjourn by Reginald Sanders. Seconded: Dina Richard. The meeting concluded at 11:02 am.

Approved:

Treasurer Rachael Eubanks, Chairman

State of Michigan Retirement System

EXECUTIVE SUMMARY

State of Michigan Investment Board Meeting

March 23, 2023



Jon M. Braeutigam
Chief Investment Officer
Bureau of Investments

EXECUTIVE SUMMARY

December 31, 2022

Performance

Great peer comparison.

MPSERS Plan (12/31/22)	1-Year	3-Years	5-Years	7-Years	10-Years
Annualized Returns	-6.3%	8.4%	8.6%	9.5%	9.6%
Policy Returns	-8.0%	6.1%	7.1%	8.8%	8.9%
Peer Median Returns*	-7.8%	6.4%	6.6%	8.0%	7.9%

*State Street Universe greater than \$10 billion.

- Over the past one, three, five, seven, and ten years, the returns are significantly higher than peer median returns. The peers are defined as the State Street Universe of public pension plans greater than \$10 billion. Notably, the standard deviation of the monthly returns is below average for the longer time horizons.
- Over a very long horizon, since 1979, the annualized rate of return on the plan assets has been approximately 9.4%.
- Compounding at higher than peer returns can add significant value. For example, based on the \$51 billion December 2012 market value, a ten-year annualized return of 9.6% compared to the 7.9% peer median return added approximately \$18.4 billion in excess value.
 - This excess value equates to approximately an additional \$1.8 billion to the FY2025 budget.
 - Every year earlier that the Funds get to fully funded through investment returns exceeding the required rate of return, equates to approximately \$3 billion to the budget annually.

Asset Allocation

Market and liquidity risk.

To earn the actuarial rates of return or higher, investment risks (primarily equity risk) must be assumed. The spread between the required rate of return, and the risk-free rate is approximately 150 bps. At the end of December 2022, the equity risk (beta) is approximately 0.36; lower than peer median of approximately 0.55.

Liquidity is another fundamental risk assumed and it is managed through asset allocation. The plans have outstanding capital commitments to fund approximately \$17.8 billion in illiquid assets. In the December 2022 quarter, \$500 million of new commitments were made.

The combined systems paid out approximately \$1.2 billion net of contributions over the past twelve months ending in December 2022. Over the past year, approximately, the allocations to real return and opportunistic were reduced by \$2.8 billion, domestic equity was reduced by \$1.5 billion, international equity by \$200 million, private equity by \$165 million, long-term fixed income by \$93 million and short-term fixed income by \$29 million. Over the past year, the allocations to real estate were increased by \$781 million and absolute return by \$2.9 billion.

NEW COMMITMENTS

October 1, 2022 – December 31, 2022

(\$ Millions)

Asset class	Fund Name / (Managed By)	Commitment
Private Equity		
	GTCR XIV, LP (GTCR LLC)	\$150
Real Estate and Infrastructure		
	Lone Star Fund XII, LP (Lone Star Management Co. XII, Ltd.)	\$300
	Avanath Affordable Housing Renaissance Fund, LP (Avanath Capital Management, LLC)	50
TOTAL		\$500

State of Michigan Retirement System

PERFORMANCE

State of Michigan Investment Board Meeting

March 23, 2023



Jon M. Braeutigam
Chief Investment Officer
Bureau of Investments

Bureau of Investments

Mission Statement

The Bureau of Investments continually strives to provide quality investment management services, broad professional expertise, and independent advice to the State of Michigan Investment Board as fiduciary of the State of Michigan Retirement System, and independent of the Board, to the State Treasurer for various Michigan trust funds and the State's common cash, for which the State Treasurer is the fiduciary.

SMRS Goals

Maintain sufficient liquidity to pay benefits.

*Meet or exceed the actuarial assumption
over the long term.*

*Perform in the top half of the public plan
universe over the long term.*

Diversify assets to reduce risk.

*Exceed individual asset class benchmarks
over the long term.*

MPSERS PENSION

Time-Weighted Rates of Return

Periods Ending December 31, 2022

	% of Portfolio 12/31/22	Ten Years ¹		Seven Years ¹		Five Years ¹		Three Years ¹		One Year		Current Quarter	
		Rate	Rank	Rate	Rank	Rate	Rank	Rate	Rank	Rate	Rank	Rate	Rank
TOTAL PLAN	100.0	9.6	12	9.5	12	8.6	12	8.4	11	-6.3	21	3.7	82
Median - Greater than \$10 Billion ²		7.9		8.0		6.6		6.4		-7.8		4.0	
MPSERS Total Plan Policy		8.9		8.8		7.1		6.1		-8.0		3.7	
PRIVATE EQUITY AND VENTURE CAPITAL	24.2	15.8	8	16.2	13	17.4	14	20.1	10	-2.4	74	-2.9	93
Median ²		10.9		11.6		11.3		12.6		2.6		0.1	
Private Equity and VC Benchmark ³		15.0		14.7		12.5		11.4		-12.9		-4.2	
DOMESTIC EQUITIES	18.6	11.6	31	10.2	33	7.6	42	4.4	77	-22.5	100	6.9	54
Median ²		9.6		8.9		6.6		5.5		-15.9		7.0	
S&P 1500 Index		12.4		11.3		9.2		7.6		-17.8		7.8	
INTERNATIONAL EQUITIES	13.6	4.6	77	5.1	52	1.1	84	0.0	92	-19.2	85	13.7	77
Median ²		4.8		5.2		1.8		1.0		-15.8		14.9	
MSCI ACWI ex USA Net Index ⁴		3.9		4.8		0.9		0.1		-16.0		14.3	
REAL RETURN AND OPPORTUNISTIC	12.0	13.1		13.1		14.8		15.6		14.7		8.1	
50% (CPI + 4%) + 50% (actuarial rate) ⁵		7.4		7.5		7.5		7.8		8.3		1.2	
REAL ESTATE & INFRASTRUCTURE	10.8	11.0	46	10.0	36	10.2	30	10.6	30	19.6	30	2.3	8
Median ²		10.9		9.0		9.2		10.3		8.3		-0.5	
NCREIF Property Index ⁶		7.4		6.1		6.1		6.7		4.2		-3.8	
NCREIF Open Fund Index Net		9.1		7.6		7.7		9.0		6.6		-5.2	
ABSOLUTE RETURN	10.1	5.8		5.7		6.2		7.4		2.9		1.3	
1-Month T-Bill + 400 bps		4.7		5.0		5.2		4.7		5.5		4.9	
HFRI Benchmark ⁷		3.7		3.4		3.8		4.8		0.0		0.3	
FIXED INCOME	9.2	2.4	22	2.5	30	1.2	18	-1.4	31	-10.9	28	1.7	53
Median ²		1.5		1.6		0.6		-1.8		-12.7		1.7	
Bloomberg US Agg Index		1.1		0.9		0.0		-2.7		-13.0		1.9	
CASH EQUIVALENTS	1.5	1.1		1.4		1.5		1.0		1.6		0.8	
1 Month T-Bill		0.7		1.0		1.2		0.7		1.5		0.9	

¹ Annualized Returns and Percentile Rank.

² Comparison universe is the State Street Universe comprised of Public Funds greater than \$10 billion on the total plan level and greater than \$1 billion for asset classes.

³ SP500 + 300 bps with a 3 month lag.

⁴ History from 10/1/2010 to 6/30/14 reflects MSCI ACWI ex USA (gross).

⁵ Current actuarial rate is 6%. History prior to 12/1/18 reflects 50% (CPI +5%) + 50% (actuarial rate).

⁶ NCREIF Property Index is NPI minus 130 bps.

⁷ FOF Conservative 1 month lagged.

Source: State Street Analytics; the NCREIF - NPI (Property Index) source is NCREIF.

Cumulative and Consecutive Total Fund Returns

MPSERS

Cumulative For Years Ending 12/31/22

	1 Year	2 Year	3 Year	4 Year	5 Year	6 Year	7 Year	8 Year	9 Year	10 Year
MPSERS	-6.3	7.0	8.4	10.1	8.6	9.8	9.5	8.6	8.9	9.6
Public Plan - Median (> \$10 billion)*	-7.8	3.3	6.4	8.7	6.6	7.9	8.0	7.0	6.8	7.9
Rank	21	16	11	12	12	12	12	12	12	12
bp Difference - Median	148	367	204	142	202	188	146	162	213	174

Consecutive For Years Ending

	12/22	12/21	12/20	12/19	12/18	12/17	12/16	12/15	12/14	12/13
MPSERS	-6.3	22.2	11.2	15.4	2.7	16.2	7.4	2.8	11.3	16.4
Public Plan - Median (> \$10 billion)*	-7.8	17.0	12.1	16.6	-1.8	15.1	7.9	0.3	7.4	14.7
Rank	21	7	71	61	7	37	66	6	7	34
bp Difference - Median	148	519	-87	-125	454	107	-43	245	390	168

MSERS

Cumulative For Years Ending 12/31/22

	1 Year	2 Year	3 Year	4 Year	5 Year	6 Year	7 Year	8 Year	9 Year	10 Year
MSERS	-6.4	7.0	8.4	10.1	8.6	9.8	9.5	8.6	8.9	9.6
Public Plan - Median (> \$1 billion)*	-8.9	2.9	6.1	8.6	6.4	7.9	7.9	6.9	6.8	7.8
Rank	26	11	8	8	8	8	8	8	8	9
bp Difference - Median	255	411	228	152	219	192	162	169	216	186

Consecutive For Years Ending

	12/22	12/21	12/20	12/19	12/18	12/17	12/16	12/15	12/14	12/13
MSERS	-6.4	22.3	11.2	15.4	2.7	16.2	7.5	2.8	11.3	16.3
Public Plan - Median (> \$1 billion)*	-8.9	16.9	12.2	16.9	-2.4	15.3	7.5	0.4	6.9	15.0
Rank	26	4	76	69	5	43	51	4	5	39
bp Difference - Median	255	538	-92	-149	507	92	-3	237	439	126

*State Street Public Funds Universe

Cumulative and Consecutive Total Fund Returns

MSPRS

Cumulative For Years Ending 12/31/22

	1 Year	2 Year	3 Year	4 Year	5 Year	6 Year	7 Year	8 Year	9 Year	10 Year
MSPRS	-6.4	7.0	8.4	10.1	8.6	9.8	9.5	8.6	8.9	9.6
Public Plan - Median (> \$1 billion)*	-8.9	2.9	6.1	8.6	6.4	7.9	7.9	6.9	6.8	7.8
Rank	26	12	9	9	9	9	9	9	9	9
bp Difference - Median	254	408	227	149	217	190	160	167	214	184

Consecutive For Years Ending

	12/22	12/21	12/20	12/19	12/18	12/17	12/16	12/15	12/14	12/13
MSPRS	-6.4	22.2	11.3	15.3	2.7	16.2	7.5	2.8	11.3	16.2
Public Plan - Median (> \$1 billion)*	-8.9	16.9	12.2	16.9	-2.4	15.3	7.5	0.4	6.9	15.0
Rank	26	5	75	70	5	43	52	5	5	40
bp Difference - Median	254	533	-89	-154	506	92	-6	236	435	118

MJRS

Cumulative For Years Ending 12/31/22

	1 Year	2 Year	3 Year	4 Year	5 Year	6 Year	7 Year	8 Year	9 Year	10 Year
MJRS	-6.3	6.2	7.9	9.7	8.2	9.5	9.2	8.4	8.7	9.4
Public Plan - Median (> \$1 billion)*	-8.9	2.9	6.1	8.6	6.4	7.9	7.9	6.9	6.8	7.8
Rank	25	13	12	17	9	9	10	10	9	10
bp Difference - Median	259	332	174	109	185	164	138	148	194	160

Consecutive For Years Ending

	12/22	12/21	12/20	12/19	12/18	12/17	12/16	12/15	12/14	12/13
MJRS	-6.3	20.4	11.2	15.3	2.7	16.3	7.4	2.8	11.0	15.6
Public Plan - Median (> \$1 billion)*	-8.9	16.9	12.2	16.9	-2.4	15.3	7.5	0.4	6.9	15.0
Rank	25	15	76	71	5	41	53	5	5	48
bp Difference - Median	259	352	-94	-155	503	101	-7	236	412	61

*State Street Public Funds Universe

State of Michigan Retirement System

ASSET ALLOCATION REVIEW

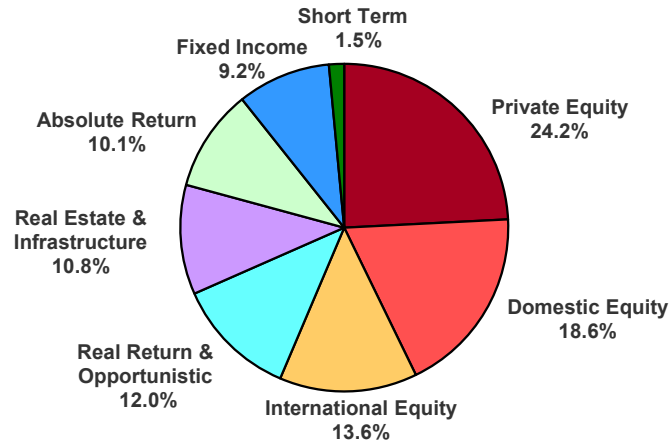
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Gregory J. Parker, CFA
Director of Investments – Public Markets
Director of Asset Allocation
Bureau of Investments

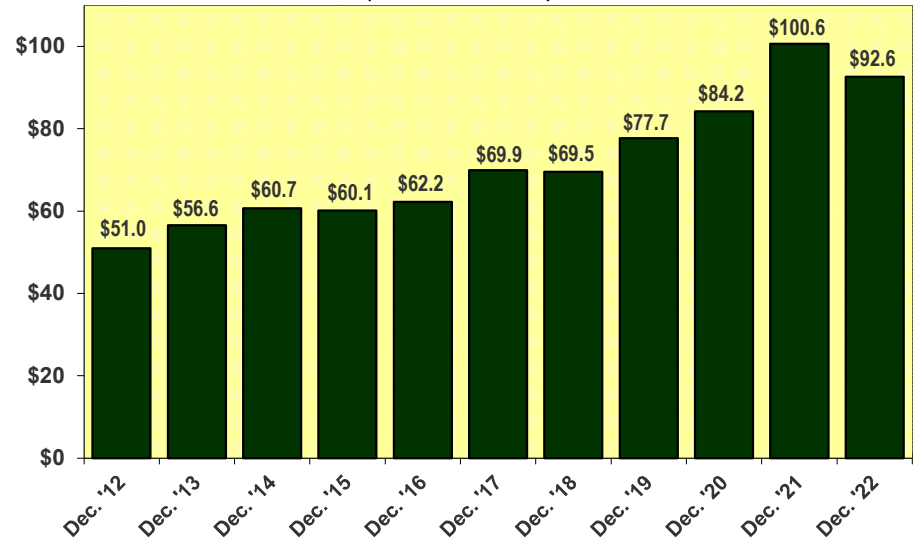
STATE OF MICHIGAN RETIREMENT SYSTEM PROFILE - DECEMBER 2022

Asset Allocation ~ 12/31/22



Market Value*

(Billions of Dollars)



Asset Allocation By Market Value
(In Millions)

Investment Strategies	12/31/2022		12/31/2021	
Private Equity	\$22,383	24.2%	\$23,254	23.1%
Domestic Equity	17,200	18.6%	23,894	23.8%
International Equity	12,622	13.6%	15,889	15.8%
Real Return & Opportunistic	11,138	12.0%	12,371	12.3%
Real Estate & Infrastructure	10,028	10.8%	7,713	7.7%
Absolute Return	9,339	10.1%	6,262	6.2%
Fixed Income	8,534	9.2%	9,703	9.6%
Short Term***	1,367	1.5%	1,479	1.5%
TOTAL	\$92,611	100.0%	\$100,565	100.0%

Market Value By Plan ~ 12/31/22

(in Millions)

	Pension Plan Mkt. Value	OPEB** Mkt. Value	Combined Mkt. Value	%
MPSERS	\$60,742	\$10,976	\$71,718	77.4%
MSERS - (closed)	13,309	5,200	18,509	20.0%
MSPRS	1,725	379	2,104	2.3%
MJRS - (closed)	268	12	280	0.3%
TOTAL	\$76,044	\$16,567	\$92,611	100.0%

MSERS includes the Military Pension Fund

Short Term Equivalents (in Billions)

Short Term Strategy***	\$1.4	
Short Term in Other Inv. Strategies	0.7	
TOTAL SHORT TERM	\$2.1	2.3% of Total Funds

16th Largest State Public Retirement System in the U.S.

Pensions & Investments survey - February 14, 2022 issue

*The combined net payout for the plans for FY 2021 was \$1.5 billion with \$24.4 billion paid out FY 2010 thru FY 2021 (Pension ACFRs). This represents the amount paid to beneficiaries in excess of employer and employee contributions.

**OPEB - Other Post Employment Benefits

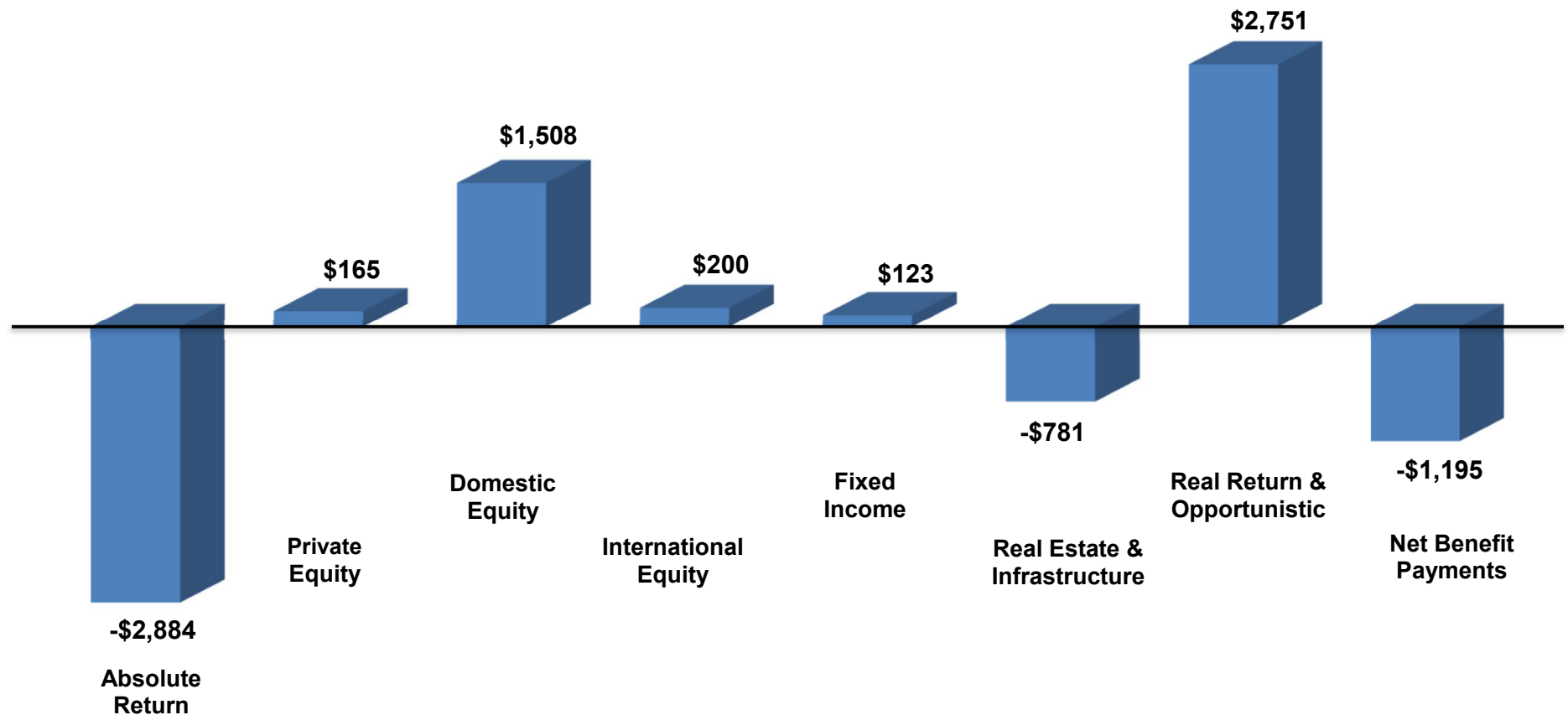
Sources and Uses of Cash

January 2022 ~ December 2022

1/1/22 Short-Term Cash Balance: \$ 1,479

12/31/22 Short-Term Cash Balance: 1,366

Net Short-Term Cash Decrease: \$ 113



A negative number in an asset category indicates a use of cash, a positive number indicates a source of cash.

Dollars in millions

Asset Allocation Targets

As of 12/31/22

	MPERS		MSERS		MSPRS		MJRS		SMRS
Asset Class	12/31/22	Target*	12/31/22	Target*	12/31/22	Target*	12/31/22	Target*	Ranges
Private Equity	24.2%	16.0%	24.3%	16.0%	24.2%	16.0%	24.3%	16.0%	13% - 27%
Domestic Equity	18.6%	25.0%	18.7%	25.0%	18.6%	25.0%	18.7%	25.0%	17% - 32%
International Equity	13.6%	15.0%	13.7%	15.0%	13.7%	15.0%	13.7%	15.0%	12% - 22%
Real Return & Opportunistic	12.0%	10.0%	12.1%	10.0%	12.1%	10.0%	12.1%	10.0%	8% - 18%
Real Estate & Infrastructure	10.8%	10.0%	10.9%	10.0%	10.9%	10.0%	10.9%	10.0%	8% - 18%
Absolute Return	10.1%	9.0%	10.1%	9.0%	10.1%	9.0%	10.1%	9.0%	5% - 11%
Long Term Fixed Income	9.2%	13.0%	9.3%	13.0%	9.2%	13.0%	9.3%	13.0%	8% - 18%
Short Term Fixed Income	1.5%	2.0%	0.9%	2.0%	1.2%	2.0%	0.9%	2.0%	1% - 8%
TOTAL	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	

*Complies with basket clause and international restrictions.

State of Michigan Retirement System

MARKETS REVIEW AND OUTLOOK

State of Michigan Investment Board Meeting

March 23, 2023



Gregory J. Parker, CFA

Director of Investments – Public Markets

Director of Asset Allocation

Bureau of Investments

CAPITAL MARKETS

Return and Risk Assumptions, Benchmark and Outlook

A starting point.

MPSERS Plan	Assumed Return* (Arithmetic)	Standard Deviation*	Trailing 10-Year (Benchmark**)
Private Equity	12.6%	25.0%	15.0%
International Equity	9.7%	20.5%	3.9%
Real Ret/Opportunistic	10.2%	14.8%	7.4%
Domestic Equity	8.8%	17.5%	14.4%
Real Estate	9.1%	20.0%	7.4%
Absolute Return	7.9%	9.0%	3.7%
Long-Term Fixed Income	4.8%	4.0%	1.1%
Short-Term	3.8%	1.0%	0.7%

* Aon Investment Consultants 2022 Long-Term Return/Risk Assumptions

** Investment Policy Statement; Annualized Returns

*** Actual investments may differ due to changing conditions and the availability of new information

Overview

A market update.

- Interest rates at both the long and short end are earning less than the year-over-year increase in CPI. This fact is indicative of accommodative Federal Reserve policies and critics of the Fed are growing louder. The counter point is that the Fed Funds interest rate has increased by 4% over the past twelve months, and inflation is down more than 2.5% from its peak.
- The broad U.S. stock market return for the one year ending December 2022 was -18%, which is down over 17% from its high. Most of the loss occurred in the month of September when the S&P 500 lost -9.2% of value. A decline in the market more than 20% is sometimes referred to as a bear market.
- International equities outperformed domestic equities for the year ending December 2022 by -1.8%. Over the past three, five, seven, and ten years, the international market index, MSCI ACWI ex USA, underperformed the S&P 1500 index by -7.5%, -8.3%, -6.5%, and -8.6% annualized, respectively.
- There are two key variables that explain most of the under-performance of international vs. U.S. equities over the past decade; the appreciating value of the U.S. dollar and the valuation multiple changes of the markets. Each is responsible for explaining approximately half of the relative returns.
- Dividend yields on REITs at the end of December 2022 were estimated to be around 3.8%, which is nearly the same as the yield of the 10-year U.S. Treasury. This is approximately 1.3% below the historical metric.
- Commodities prices broadly, as measured by the CRB index, are up 19.5% over the 12-month period ending December 2022. The price for crude oil was up 6.7% year-over-year and ended December 2022 at \$80.26 per barrel.

U.S. Fixed Income

Repricing within the fixed income markets

- The repricing happening within the fixed income market is remarkable. During the month of October 2022, the 10-year U.S. Treasury rate hit a high mark of 4.24%. This is the highest level since 2008. Coinciding with the high in long-term rates, the benchmark U.S. Aggregate index yield to maturity hit a high level of 5.28%. This is also the highest yield since 2008.
- During the December 2022 quarter, the U.S. Federal Reserve Board increased the policy interest rate twice by a combined 125 basis points. As a result of these actions, the yield curve from the 2-year maturity to the 10-year maturity is inverted by approximately 55 bps. This is the greatest differences in these two yields since September 1981.
- Interest rates at both the long and short end are earning less than the year-over-year increase in CPI. This fact is indicative of accommodative Federal Reserve policies and critics of the Fed are growing louder. The counter point is that the Fed Funds interest rate has increased by 4% over the past twelve months, and inflation is down more than 2.5% from its peak.
- Over the past year, investment grade corporate spreads have widened by approximately 20 bps. High yield spreads have also widened over the past year; by approximately 190 bps. Both spreads are slightly higher than long-term averages.

Domestic Equity

Correction in domestic equity prices.

- The broad U.S. stock market return for the one year ending December 2022 was -18%, which is down over 17% from its high. Most of the loss occurred in the month of September when the S&P 500 lost -9.2% of value. A decline in the market more than 20% is sometimes referred to as a bear market.
- With the correction in prices, many valuation metrics are near historical averages, suggesting the market is fairly priced. The concern is that the risk of a potential recession may not be fully priced in, and many strategists believe that if a recession were to actually materialize, valuations will continue to cheapen.
- Fundamentally, the market's returns on equity continue to be historically higher than average and some of the largest companies in the market today are less cyclical (economically sensitive) than past market leaders. These facts lend support to the argument that higher valuations are justified, and therefore the market could perhaps continue to deliver historical average rates of return in the future.

International Equity

Good relative valuations.

- International equities outperformed domestic equities for the year ending December 2022 by -1.8%. Over the past three, five, seven, and ten years, the international market index, MSCI ACWI ex USA, underperformed the S&P 1500 index by -7.5%, -8.3%, -6.5%, and -8.6% annualized, respectively.
- There are two key variables that explain most of the under-performance of international vs. U.S. equities over the past decade; the appreciating value of the U.S. dollar and the valuation multiple changes of the markets. Each is responsible for explaining approximately half of the relative returns.

- The DXY index is often referred to as a measure of U.S. dollar value relative to other developed nation currencies. At the end of September 2022, the index hit a value of 112, a twenty-year high, but fell almost -10% in the fourth quarter. Year-over-year, the index rose 8.2% and over the past ten years the value has appreciated by approximately 2.6% annually. By several measures, the price is technically and fundamentally stretched.
- Based on a price-to-earnings valuation multiple, excluding non-earning companies, developed international markets trade at approximately a 28% discount to U.S. counterparts while emerging markets are at a 47% discount.

Real Estate

Comparing public vs. private real estate.

- Over the one year ending December 2022, the NAREIT index decreased by -25% including dividends, which was -31.5% lower than their private market counterparts. Over the medium to longer-term, publicly traded REITs have earned 0.5% - 1.5% higher return than their private market counterparts but they are about three times more volatile.
- Dividend yields on REITs at the end of December 2022 were estimated to be around 3.8%, which is nearly the same as the yield of the 10-year U.S. Treasury. This is approximately 1.3% below the historical metric.

Commodities

Inflation; supply and demand issues.

- Fed policy remains accommodative, and the attention has turned towards inflation. The December 2022 reading for non-seasonally adjusted year-over-year CPI was 6.5% which was down from 8.2% the quarter prior. For comparison, the 20-year average for CPI is 2.3%.
- The commodities prices broadly, as measured by the CRB index, are up 19.5% over the 12-month period ending December 2022. The price for crude oil was up 6.7% year-over-year and ended December 2022 at \$80.26 per barrel.
- An additional complication for assessing the inflation picture is the war between Russia and Ukraine which started on February 24, 2022. Ukraine is a major exporter of wheat, and the price of wheat has jumped 33% since the conflict began. Also, China's Covid-19 mitigation policies have had an impact on shipping.

Annual Total Returns of Key Asset Classes 2003 - 2022

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	
Best ↑	Int'l Equity	Int'l Equity	Real Estate	Int'l Equity	Int'l Equity	Gov't Bonds	Int'l Equity	U.S. Equity	Real Estate	Int'l Equity	U.S. Equity	U.S. Equity	Real Estate	U.S. Equity	Int'l Equity	Real Estate	U.S. Equity	U.S. Equity	U.S. Equity	Inflation	Best ↑
	40.82%	20.90%	20.06%	26.65%	16.65%	12.38%	41.44%	16.38%	14.26%	16.83%	32.80%	13.08%	13.32%	11.93%	27.19%	6.71%	30.90%	17.92%	28.45%	6.50%	
	U.S. Equity	Real Estate	Int'l Equity	Real Estate	Real Estate	Cash	U.S. Equity	Real Estate	Gov't Bonds	U.S. Equity	Int'l Equity	Real Estate	U.S. Equity	Real Estate	U.S. Equity	Inflation	Int'l Equity	Int'l Equity	Real Estate	Real Estate	
	29.58%	14.48%	16.62%	16.59%	15.84%	2.05%	27.24%	13.11%	9.02%	16.17%	15.29%	11.81%	1.01%	7.97%	21.13%	1.91%	22.13%	10.65%	17.70%	5.50%	
	Hedge Funds	U.S. Equity	U.S. Equity	U.S. Equity	Gov't Bonds	Inflation	Corp. Bonds	Int'l Equity	Corp. Bonds	Real Estate	Real Estate	Corp. Bonds	Gov't Bonds	Corp. Bonds	Real Estate	Cash	Corp. Bonds	Corp. Bonds	Int'l Equity	Cash	
	9.01%	11.78%	5.65%	15.34%	8.67%	0.10%	16.05%	11.15%	8.35%	10.54%	10.99%	7.53%	0.86%	5.63%	6.96%	1.88%	14.54%	9.89%	8.29%	1.46%	
	Real Estate	Hedge Funds	Hedge Funds	Hedge Funds	Hedge Funds	Corp. Bonds	Hedge Funds	Corp. Bonds	Inflation	Corp. Bonds	Hedge Funds	Gov't Bonds	Inflation	Int'l Equity	Corp. Bonds	Gov't Bonds	Gov't Bonds	Gov't Bonds	Hedge Funds	Hedge Funds	
	8.99%	5.83%	5.13%	9.21%	7.68%	-3.07%	9.65%	8.46%	2.96%	9.37%	7.70%	4.92%	0.66%	4.50%	6.42%	0.88%	6.83%	7.94%	7.56%	0.12%	
	Corp. Bonds	Corp. Bonds	Inflation	Cash	U.S. Equity	Real Estate	Inflation	Gov't Bonds	U.S. Equity	Hedge Funds	Inflation	Hedge Funds	Hedge Funds	Inflation	Hedge Funds	Hedge Funds	Real Estate	Hedge Funds	Inflation	Gov't Bonds	
	7.69%	5.25%	3.42%	4.81%	5.47%	-6.46%	2.72%	5.52%	1.75%	4.22%	1.49%	3.14%	0.37%	2.09%	3.88%	-1.05%	6.42%	4.75%	7.12%	-12.32%	
	Gov't Bonds	Gov't Bonds	Cash	Corp. Bonds	Corp. Bonds	Hedge Funds	Cash	Hedge Funds	Cash	Gov't Bonds	Cash	Inflation	Cash	Hedge Funds	Gov't Bonds	Corp. Bonds	Hedge Funds	Real Estate	Cash	Int'l Equity	
	2.36%	3.48%	3.06%	4.27%	5.10%	-19.86%	0.19%	5.07%	0.10%	2.02%	0.07%	0.68%	0.01%	1.89%	2.30%	-2.51%	4.40%	1.60%	0.05%	-15.57%	
	Inflation	Inflation	Gov't Bonds	Gov't Bonds	Cash	U.S. Equity	Gov't Bonds	Inflation	Hedge Funds	Inflation	Corp. Bonds	Cash	Corp. Bonds	Gov't Bonds	Inflation	U.S. Equity	Inflation	Inflation	Corp. Bonds	Corp. Bonds	
	1.88%	3.25%	2.65%	3.46%	5.03%	-36.72%	-2.19%	1.50%	-3.55%	1.70%	-2.01%	0.04%	-0.77%	1.05%	2.12%	-4.96%	2.29%	1.40%	-1.04%	-15.76%	
	Cash	Cash	Corp. Bonds	Inflation	Inflation	Int'l Equity	Real Estate	Cash	Int'l Equity	Cash	Gov't Bonds	Int'l Equity	Int'l Equity	Cash	Cash	Int'l Equity	Cash	Cash	Gov't Bonds	U.S. Equity	
	1.16%	1.33%	1.95%	2.55%	4.06%	-45.52%	-16.86%	0.13%	-13.71%	0.11%	-2.60%	-3.87%	-5.67%	0.27%	0.84%	-14.20%	2.28%	0.45%	-2.28%	-17.78%	
Worst ↓																				Worst ↓	

Annualized Returns 2003 - 2022																				
Return Risk			Cash		Inflat.		Gov't		Hedge		Corp.		Int'l.		R.E.		US Eq.			
			1.27%		2.50%		2.61%		3.24%		4.12%		7.21%		8.63%		9.92%			
			0.78%		1.59%		4.83%		5.33%		6.48%		19.31%		4.98%		16.33%			

- Hedge Funds are represented by the HFRI FOF Conservative Index
- Inflation is represented by the U.S. Consumer Price Index (SA)
- International Equity is represented by the MSCI - AC World EX-USA Index
- Cash is represented by 30-day T-Bills
- U.S. Equity is represented by the S&P 1500 Index
- Real Estate is represented by the NCREIF National Property Index
- Corporate Bonds are represented by the BBG Barclays - U.S. Corp. Inv. Gd. Index
- Government Bonds are represented by the BBG Barclays - U.S. Government Index

State of Michigan Retirement System

DEFINED CONTRIBUTION REVIEW

State of Michigan Investment Board Meeting
March 23, 2023



Lan Hue Chen, CFA, CAIA
Senior Investment Manager
Defined Contribution, Trusts & Agencies Division

EXECUTIVE SUMMARY

Market Environment and Outlook

The major U.S. and non-U.S. stock indexes overcame negative returns in December 2022 to end the fourth quarter with gains. U.S. stock results varied by market capitalization: mid-caps were the strongest performers, followed by large caps and small caps. Across market cap segments, value styles outperformed growth styles. Technology stocks continued to suffer from rising interest rates and posted losses for the quarter.

Broad gauges of U.S. and non-U.S. bonds posted gains for the quarter. Non-U.S. bonds gained more than twice as much as U.S. bonds. Results varied at the asset-class level: long-term U.S. Treasury securities sustained the largest losses, whereas long-term corporate bonds and high yield were among the strongest performers. Shorter-term corporate bonds and government securities saw positive returns.

Legislative Update

On December 29, 2022, President Biden signed the year-end omnibus spending package, which contained the SECURE 2.0 Act ("the Act"). Building on the SECURE Act of 2019, 2.0 will have widespread implications for both the retirement industry and individual savers.

The Act includes almost ninety provisions intended to encourage the adoption of employer-sponsored plans and lifetime income options, altering plan distribution rules, easing administrative requirements, improving certain types of defined benefit plans, and more.

Key provisions include the following:

- **RMDs will start later.** Required minimum distributions (RMDs) will begin at age 73 in 2023, moving to age 75 in 2033.
- **Catch-up contribution limits will be increased.** Effective in 2025, the catch-up contribution limit for participants in most employer plans aged 60 to 63 (at tax year-end) rises to the greater of \$10,000 or 150% of the regular catch-up amount applicable in 2025 (the regular catch-up limit for 2023 is \$7,500). The increased limits will be indexed for inflation after 2025. In addition, catch-up contributions made to qualified retirement plans by participants with compensation of more than \$145,000 are required to be made on a Roth basis after 2023.
- **Matching contributions may be made on a Roth basis and can match student loan payments.** Effective upon enactment, the Act authorizes defined contribution (DC) plan sponsors to provide participants with the option of receiving matching and non-elective contributions on a Roth basis. Beginning in plan year 2024, employers offering 401(k), 457, or 403(b) plans will be allowed to treat student loan payments as elective deferrals for the purposes of matching contributions.

- **Emergency withdrawal options expand.** Starting in 2024, distributions of up to \$1,000 per year from plans and IRAs will be exempt from the typical 10% early withdrawal penalty when used for personal or family emergency expenses. Also beginning in 2024, employers will also be allowed to offer emergency savings accounts to most participants in DC plans, with the option for default contributions of up to 3% (to a cap of \$2,500).
- **Some barriers to in-plan annuities are lowered.** Effective immediately, the prior cap on the purchase of qualifying longevity annuity contracts (25% of account balance) is repealed, and participants may use up to \$200,000 (indexed to inflation) to purchase qualifying longevity annuity contracts (QLACs). In 2023 annuities purchased in qualified plans and IRAs will satisfy the RMD rules even if the annuity includes provisions that increase annual payments up to 5% per year.
- **Default IRAs are reworked.** After 2023, employers can roll former employees' workplace retirement plan accounts into a default IRA if their account balances are between \$1,000 and \$7,000 (the current upper limit is \$5,000). In 2024, retirement plan service providers will be allowed to offer plans the option for automatic portability services where a participant's default IRA may be automatically transferred into the retirement plan of the participant's new employer.

SMRS

Defined Contribution Strategies

12/31/22

Markets	Amount		% of Total	Fee per \$1,000
QDIA (\$ in Millions)				
	<u>12/31/22</u>	<u>12/31/21</u>		
Total Target Date Fund	\$3,445	\$3,665	30.3%	\$0.55
Tier I Index Funds				
State Street S&P 500 Index Fund	\$1,613	\$1,966		\$0.13
State Street Bond Market Index Fund	1,014	1,145		0.20
State Street Global All Cap Equity ex-U.S. Index Fund	769	876		0.45
State Street S&P Mid Cap Index Fund	700	806		0.20
BlackRock Government Short-Term Investment CL F	248	225		0.56
BlackRock S&P Small Cap 600 Equity Index CL F	163	192		0.25
BlackRock Emerging Markets Index CL F	103	131		0.69
Total Tier I Index	\$4,610	\$5,341	40.6%	\$0.25
Tier II Active Funds				
Stable Value Fund	\$1,256	\$1,224		\$2.14
Dodge & Cox Stock Fund	634	706		4.12
Jennison Large Cap Growth Fund	358	637		2.96
American Funds EuroPacific Growth R6	237	340		4.60
T. Rowe Price Mid-Cap Value Fund	146	148		6.20
Artisan Mid Cap Fund	109	188		7.08
Voya Small Cap Growth Equity Fund	119	164		3.32
PIMCO Total Return I Fund	98	120		4.60
Virtus Ceredex Small-Cap Value Eq I	69	81		6.50
Prudential High Yield Fund	41	50		3.76
Total Tier II Active	\$3,067	\$3,657	27.0%	\$3.45
Tier III				
Total Self Directed Brokerage Account	\$236	\$315	2.1%	NA
Total Defined Contribution Assets	\$11,359	\$12,978	100.0%	\$1.20

*Loan Fund \$191M as of 12/31/22

NOTE: Totals may not be exact due to rounding.

Defined Contribution Performance by Fund

12/31/22

<u>Fund Name</u>	<u>Market Value</u>	<u>1-Yr</u>	<u>3-Yrs</u>	<u>5-Yrs</u>	<u>10-Yrs</u>
State Street Target Retirement Income Fund	\$110,071,753	(11.0)	1.8	3.1	3.7
State Street Income Custom Index		(11.0)	1.8	3.0	3.7
Morningstar Target-Date Retirement		(12.8)	0.0	1.8	3.2
<i>Variance State Street Income Custom Index</i>		0.0	0.0	0.1	0.0
<i>Variance Morningstar Target-Date Retirement</i>		1.8	1.8	1.3	0.5
State Street Target Retirement 2020 Fund	\$127,920,747	(12.2)	2.3	3.6	5.5
State Street 2020 Custom Index		(12.2)	2.3	3.6	5.6
Morningstar Target-Date 2020		(14.4)	0.9	2.7	4.6
<i>Variance State Street 2020 Custom Index</i>		0.0	0.0	0.0	(0.1)
<i>Variance Morningstar Target-Date 2020</i>		2.2	1.4	0.9	0.9
State Street Target Retirement 2025 Fund	\$254,185,575	(14.9)	2.8	4.2	6.4
State Street 2025 Custom Index		(14.8)	2.8	4.1	6.5
Morningstar Target-Date 2025		(15.2)	1.3	3.1	5.4
<i>Variance State Street 2025 Custom Index</i>		(0.1)	0.0	0.1	(0.1)
<i>Variance Morningstar Target-Date 2025</i>		0.3	1.5	1.1	1.0
State Street Target Retirement 2030 Fund	\$327,844,892	(17.0)	2.9	4.3	6.9
State Street 2030 Custom Index		(17.0)	2.8	4.3	6.9
Morningstar Target-Date 2030		(16.1)	1.9	3.5	6.0
<i>Variance State Street 2030 Custom Index</i>		0.0	0.1	0.0	0.0
<i>Variance Morningstar Target-Date 2030</i>		(0.9)	1.0	0.8	0.9
State Street Target Retirement 2035 Fund	\$382,253,344	(17.9)	3.0	4.5	7.3
State Street 2035 Custom Index		(17.9)	3.0	4.5	7.3
Morningstar Target-Date 2035		(16.9)	2.5	4.1	6.8
<i>Variance State Street 2035 Custom Index</i>		0.0	0.0	0.0	0.0
<i>Variance Morningstar Target-Date 2035</i>		(1.0)	0.5	0.4	0.5
State Street Target Retirement 2040 Fund	\$391,386,452	(18.4)	3.3	4.7	7.6
State Street 2040 Custom Index		(18.4)	3.2	4.7	7.6
Morningstar Target-Date 2040		(17.4)	3.0	4.4	7.1
<i>Variance State Street 2040 Custom Index</i>		0.0	0.1	0.0	0.0
<i>Variance Morningstar Target-Date 2040</i>		(1.0)	0.3	0.3	0.5
State Street Target Retirement 2045 Fund	\$423,514,675	(18.8)	3.5	4.8	7.8
State Street 2045 Custom Index		(18.8)	3.5	4.8	7.8
Morningstar Target-Date 2045		(17.7)	3.3	4.7	7.5
<i>Variance State Street 2045 Custom Index</i>		0.0	0.0	0.0	0.0
<i>Variance Morningstar Target-Date 2045</i>		(1.1)	0.2	0.1	0.3
State Street Target Retirement 2050 Fund	\$547,218,126	(19.1)	3.6	4.9	7.8
State Street 2050 Custom Index		(19.1)	3.6	4.9	7.8
Morningstar Target-Date 2050		(18.0)	3.4	4.8	7.5
<i>Variance State Street 2050 Custom Index</i>		0.0	0.0	0.0	0.0
<i>Variance Morningstar Target-Date 2050</i>		(1.1)	0.2	0.1	0.3

<u>Fund Name</u>	<u>Market Value</u>	<u>1-Yr</u>	<u>3-Yrs</u>	<u>5-Yrs</u>	<u>10-Yrs</u>
State Street Target Retirement 2055 Fund	\$582,126,425	(19.1)	3.6	4.9	7.8
State Street 2055 Custom Index		(19.1)	3.6	4.9	7.8
Morningstar Target-Date 2055		(18.1)	3.5	4.9	7.8
Variance State Street 2055 Custom Index		0.0	0.0	0.0	0.0
Variance Morningstar Target-Date 2055		(1.0)	0.1	0.0	0.0
State Street Target Retirement 2060 Fund	\$272,624,751	(19.1)	3.6	4.9	N/A
State Street 2060 Custom Index		(19.1)	3.6	4.9	N/A
Morningstar Target-Date 2060		(18.1)	3.5	4.9	N/A
Variance State Street 2060 Custom Index		0.0	0.0	0.0	N/A
Variance Morningstar Target-Date 2060		(1.0)	0.1	0.0	N/A
State Street Target Retirement 2065 Fund	\$26,268,246	(19.1)	3.6	N/A	N/A
State Street 2065 Custom Index		(19.1)	3.6	N/A	N/A
Morningstar Target-Date 2065+		(18.3)	3.5	N/A	N/A
Variance State Street 2065 Custom Index		0.0	0.0	N/A	N/A
Variance Morningstar Target-Date 2065+		(0.8)	0.1	N/A	N/A
TIER 1					
State Street S&P 500 Index Fund	\$1,612,880,712	(18.1)	7.6	9.4	12.5
S&P 500 Index		(18.1)	7.7	9.4	12.6
Morningstar Large Blend		(16.9)	6.2	7.7	10.6
Variance S&P 500 Index		0.0	(0.1)	0.0	(0.1)
Variance Morningstar Large Blend		(1.2)	1.4	1.7	1.9
State Street US Bond Index Fund	\$1,013,789,983	(13.2)	(2.8)	0.0	1.0
Bloomberg U.S. Aggregate Bond Index		(13.0)	(2.7)	0.0	1.1
Morningstar Intermediate Core Bond		(13.3)	(2.8)	(0.2)	0.9
Variance Bloomberg U.S. Aggregate Bond Index		(0.2)	(0.1)	0.0	(0.1)
Variance Morningstar Intermediate Core Bond		0.1	0.0	0.2	0.1
S.S. Global All Cap Equity ex-U.S. Index Fund	\$769,279,773	(16.3)	0.4	1.1	4.1
MSCI ACWI ex USA IMI (Net)		(16.6)	0.2	0.8	4.0
Morningstar Foreign Large Blend		(15.8)	0.2	0.9	3.9
Variance MSCI ACWI ex USA IMI (Net)		0.3	0.2	0.3	0.1
Variance Morningstar Foreign Large Blend		(0.5)	0.2	0.2	0.2
State Street S&P Mid Cap Index Fund	\$699,536,743	(13.1)	7.2	6.7	10.7
S&P 400 Index		(13.1)	7.2	6.7	10.8
Morningstar Mid-Cap Blend		(14.1)	6.0	5.8	9.2
Variance S&P 400 Index		0.0	0.0	0.0	(0.1)
Variance Morningstar Mid-Cap Blend		1.0	1.2	0.9	1.5
BlackRock Govt Short-Term Investment Fund	\$248,312,266	1.6	0.7	1.2	0.7
FTSE Treasury Bill 1 Mon USD		1.5	0.7	1.2	0.7
Variance FTSE Treasury Bill 1 Mon USD		0.1	0.0	0.0	0.0
BlackRock S&P Small Cap 600 Equity Index Fund	\$163,368,483	(15.9)	5.8	5.9	N/A
S&P SmallCap 600 Index		(16.1)	5.8	5.9	N/A
Morningstar Small Blend		(16.4)	4.7	4.3	N/A
Variance S&P SmallCap 600 Index		0.2	0.0	0.0	N/A
Variance Morningstar Small Blend		0.5	1.1	1.6	N/A

<u>Fund Name</u>	<u>Market Value</u>	<u>1-Yr</u>	<u>3-Yrs</u>	<u>5-Yrs</u>	<u>10-Yrs</u>
BlackRock Emerging Markets Index Fund	\$103,153,718	(20.4)	(2.9)	(1.6)	N/A
MSCI Emerging Market (Net)		(20.1)	(2.7)	(1.4)	N/A
Morningstar Diversified Emerging Mkts		(21.0)	(2.5)	(1.5)	N/A
Variance MSCI Emerging Market (Net)		(0.3)	(0.2)	(0.2)	N/A
Variance Morningstar Diversified Emerging Mkts		0.6	(0.4)	(0.1)	N/A
TIER 2					
Stable Value Fund	\$1,255,825,742	1.9	2.0	2.3	2.2
BofA Merrill Lynch US 3-Month Treasury Bill Index		1.5	0.7	1.3	0.8
Hueler Universe		1.9	2.0	2.1	2.0
Var. BofA Merrill Lynch US 3-Month Treasury Bill Index		0.4	1.3	1.0	1.4
Variance Hueler Universe		0.0	0.0	0.2	0.2
Dodge & Cox Stock Fund	\$634,003,292	(6.9)	9.2	8.6	12.4
Russell 1000 Value Index		(7.5)	6.0	6.7	10.3
Morningstar Large Value		(6.0)	6.8	6.8	9.9
Variance Russell 1000 Value Index		0.6	3.2	1.9	2.1
Variance Morningstar Large Value		(0.9)	2.4	1.8	2.5
Jennison Large Cap Growth Equity Fund	\$357,750,075	(39.4)	3.4	8.0	N/A
Russell 1000 Growth Index		(29.1)	7.8	11.0	N/A
Morningstar Large Growth		(30.2)	4.3	7.9	N/A
Variance Russell 1000 Growth Index		(10.3)	(4.4)	(3.0)	N/A
Variance Morningstar Large Growth		(9.2)	(0.9)	0.1	N/A
American Funds EuroPacific Growth R6 Fund	\$236,819,414	(22.7)	(0.2)	1.5	5.3
MSCI ACWI Ex USA NR USD		(16.0)	0.1	0.9	3.8
Morningstar Foreign Large Growth		(25.6)	(0.4)	1.6	4.7
Variance MSCI ACWI Ex USA NR USD		(6.7)	(0.3)	0.6	1.5
Variance Morningstar Foreign Large Growth		2.9	0.2	(0.1)	0.6
T. Rowe Price Mid-Cap Value Fund	\$146,472,556	(4.2)	9.4	7.0	10.7
Russell Midcap Value Index		(12.0)	5.8	5.7	10.1
Morningstar Mid-Cap Value		(8.3)	6.9	5.8	9.5
Variance Russell Midcap Value Index		7.8	3.6	1.3	0.6
Variance Morningstar Mid-Cap Value		4.1	2.5	1.2	1.2
Voya Small Cap Growth Equity Fund	\$118,733,589	(24.2)	0.3	1.4	7.9
Russell 2000 Growth Index		(26.4)	0.6	3.5	9.2
Morningstar Small Growth		(28.1)	3.0	5.6	9.6
Variance Russell 2000 Growth Index		2.2	(0.3)	(2.1)	(1.3)
Variance Morningstar Small Growth		3.9	(2.7)	(4.2)	(1.7)
Artisan Mid Cap Fund	\$109,435,128	(36.3)	3.6	8.4	10.4
Russell Midcap Growth Index		(26.7)	3.9	7.6	11.4
Morningstar Mid-Cap Growth		(28.3)	3.7	6.6	10.0
Variance Russell Midcap Growth Index		(9.6)	(0.3)	0.8	(1.0)
Variance Morningstar Mid-Cap Growth		(8.0)	(0.1)	1.8	0.4

<u>Fund Name</u>	<u>Market Value</u>	<u>1-Yr</u>	<u>3-Yrs</u>	<u>5-Yrs</u>	<u>10-Yrs</u>
PIMCO Total Return I Fund	\$98,346,160	(14.1)	(2.5)	0.0	1.1
<i>Bloomberg U.S. Aggregate Bond Index</i>		(13.0)	(2.7)	0.0	1.1
<i>Morningstar Intermediate Core-Plus Bond</i>		(13.2)	(2.4)	0.1	1.3
<i>Variance Bloomberg U.S. Aggregate Bond Index</i>		(1.1)	0.2	0.0	0.0
<i>Variance Morningstar Intermediate Core-Plus Bond</i>		(0.9)	(0.1)	(0.1)	(0.2)
Virtus Ceredex Small-Cap Value Eq I Fund	\$68,844,321	(9.6)	5.4	4.0	8.7
<i>Russell 2000 Value Index</i>		(14.5)	4.7	4.1	8.5
<i>Morningstar Small Blend</i>		(16.4)	4.7	4.3	8.5
<i>Variance Russell 2000 Value Index</i>		4.9	0.7	(0.1)	0.2
<i>Variance Morningstar Small Blend</i>		6.8	0.7	(0.3)	0.2
Prudential High Yield Fund	\$41,201,885	(11.9)	0.1	2.9	N/A
<i>Bloomberg US Corp. HY 1% Issuer Cap Index</i>		(11.1)	(0.1)	2.2	N/A
<i>Morningstar High Yield Bond</i>		(10.4)	(0.6)	1.5	N/A
<i>Var. Bloomberg S. Corp. HY 1% Issuer Cap Index</i>		(0.8)	0.2	0.7	N/A
<i>Var. Morningstar High Yield Bond</i>		(1.5)	0.7	1.4	N/A
TIER 3					
Self Directed	\$236,105,271				
TOTAL	\$11,359,274,098				

Loan Fund:

\$190,924,313

State of Michigan Retirement System

PRIVATE EQUITY REVIEW

State of Michigan Investment Board Meeting
March 23, 2023



Peter A. Woodford
Senior Investment Manager
Private Equity Division

EXECUTIVE SUMMARY

Performance

MPSERS Plan (12/31/22)	1-Year	3-Years	5-Years	7-Years	10-Years
Annualized Returns	-2.4%	20.1%	17.4%	16.2%	15.8%
PE Benchmark Returns	-12.9%	11.4%	12.5%	14.7%	15.0%
Peer Median Returns	2.6%	12.6%	11.3%	11.6%	10.9%

- It is not unusual for private equity returns to lag the public benchmark returns during periods of expansion and lead the public benchmark during periods of contraction. Over the last 10 years, the Private Equity Division outperformed the S&P by 3.2% (ten-year S&P 500 return 12.6%) and outperformed the benchmark by 0.8%.
- Private equity returns have been strong relative to peer median returns, ranking in the top 8.0% of peers over the past ten years. Outperformance to peers is attributable to strategy as well as fund and co-investment selectivity.
- For the twelve months ending December 31, 2022, the Private Equity Division returned \$165 million to the plan, net of contributions.
- Commitments closed during the quarter:
 - \$150 million to GTCR Fund XIV, LP, managed by GTCR LLC.

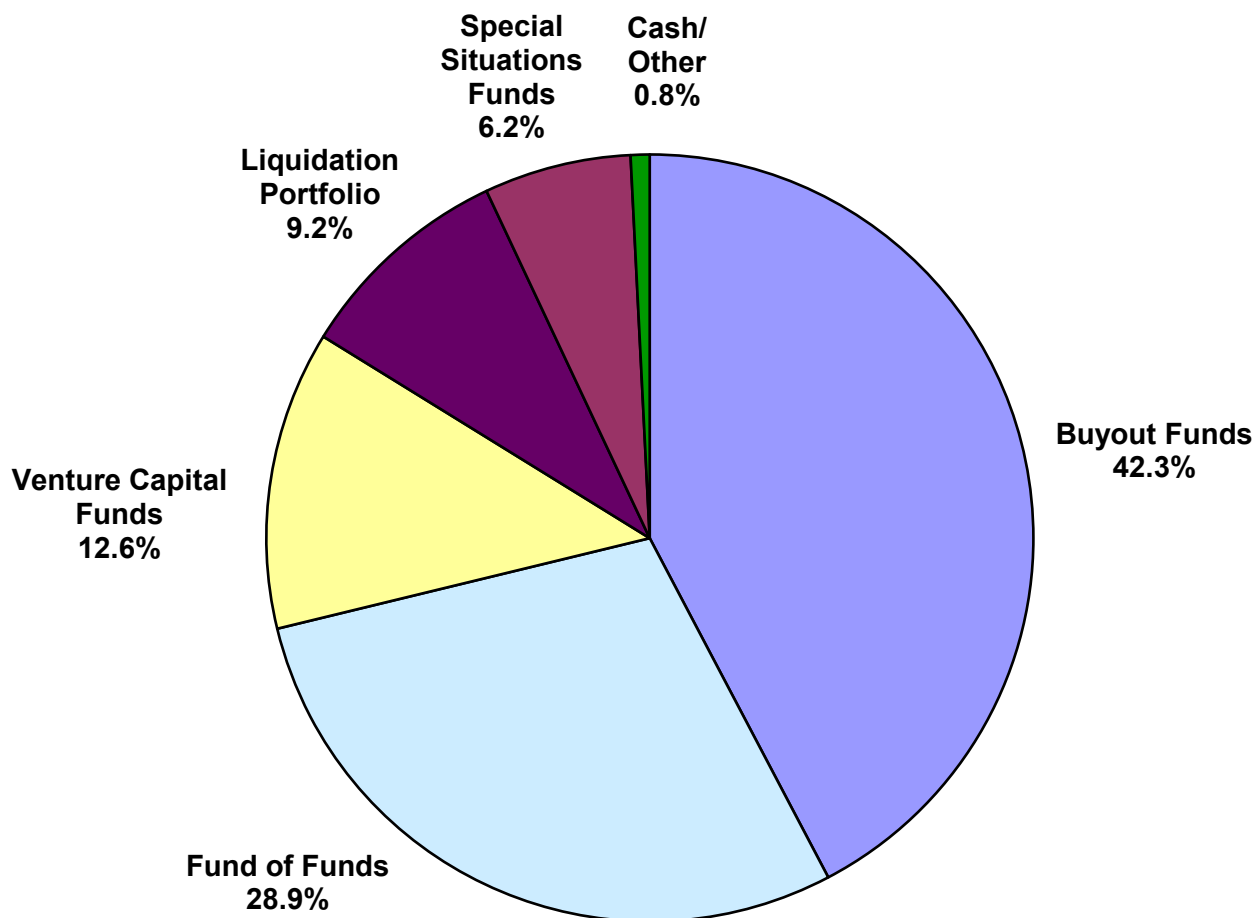
Strategy Update

The strategy for the next twelve months will focus on existing sponsors raising successor funds. This may be a combination of buyout, venture capital, secondary, and growth equity funds seeking new commitments. Co-investments continue to play an important role in both averaging down costs and targeting specific investments with attractive risk/return characteristics.

SMRS

Private Equity

12/31/22



Market Value in Millions				
	12/31/22		12/31/21	
Buyout Funds	\$9,477	42.3%	\$11,159	48.0%
Fund of Funds	6,478	28.9%	6,059	26.1%
Venture Capital Funds	2,812	12.6%	3,277	14.1%
Liquidation Portfolio	2,061	9.2%	682	2.9%
Special Situations Funds	1,378	6.2%	1,700	7.3%
Cash/Other	177	0.8%	306	1.3%
Total	\$22,383	100.0%	\$23,254 *	100.0%

* 12/31/21 total includes \$71M in Mezzanine Funds

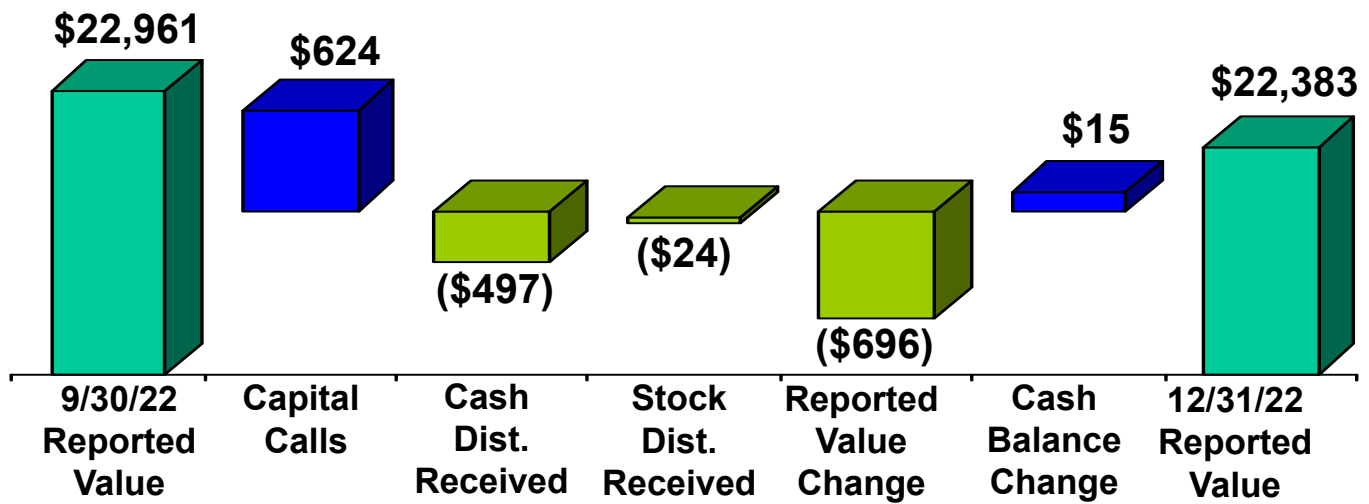
SMRS

Private Equity

12/31/22

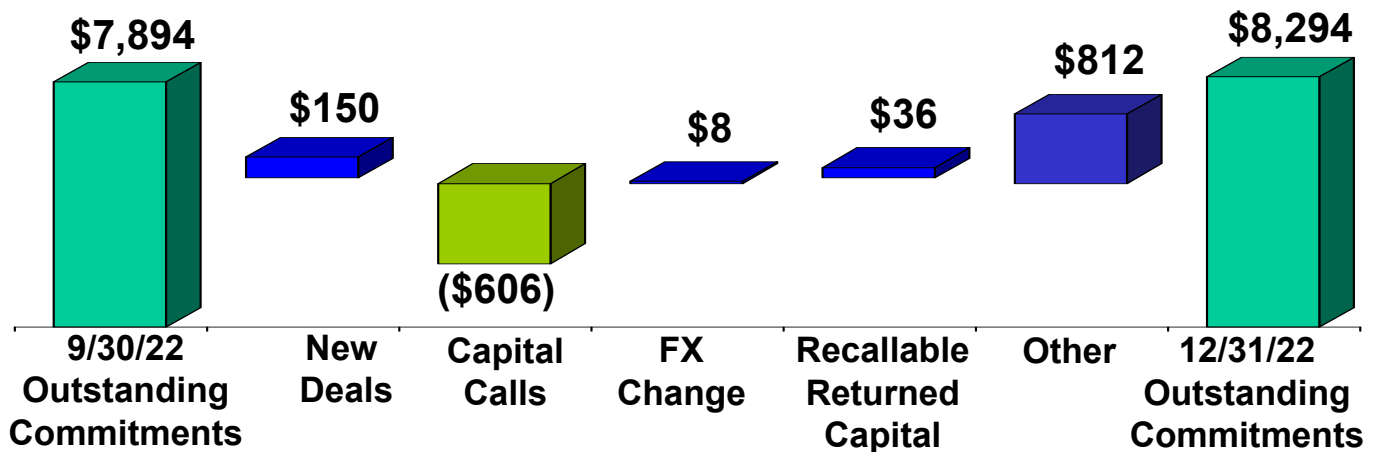
Invested Commitments

(\$ in Millions)



Outstanding Commitments

(\$ in Millions)

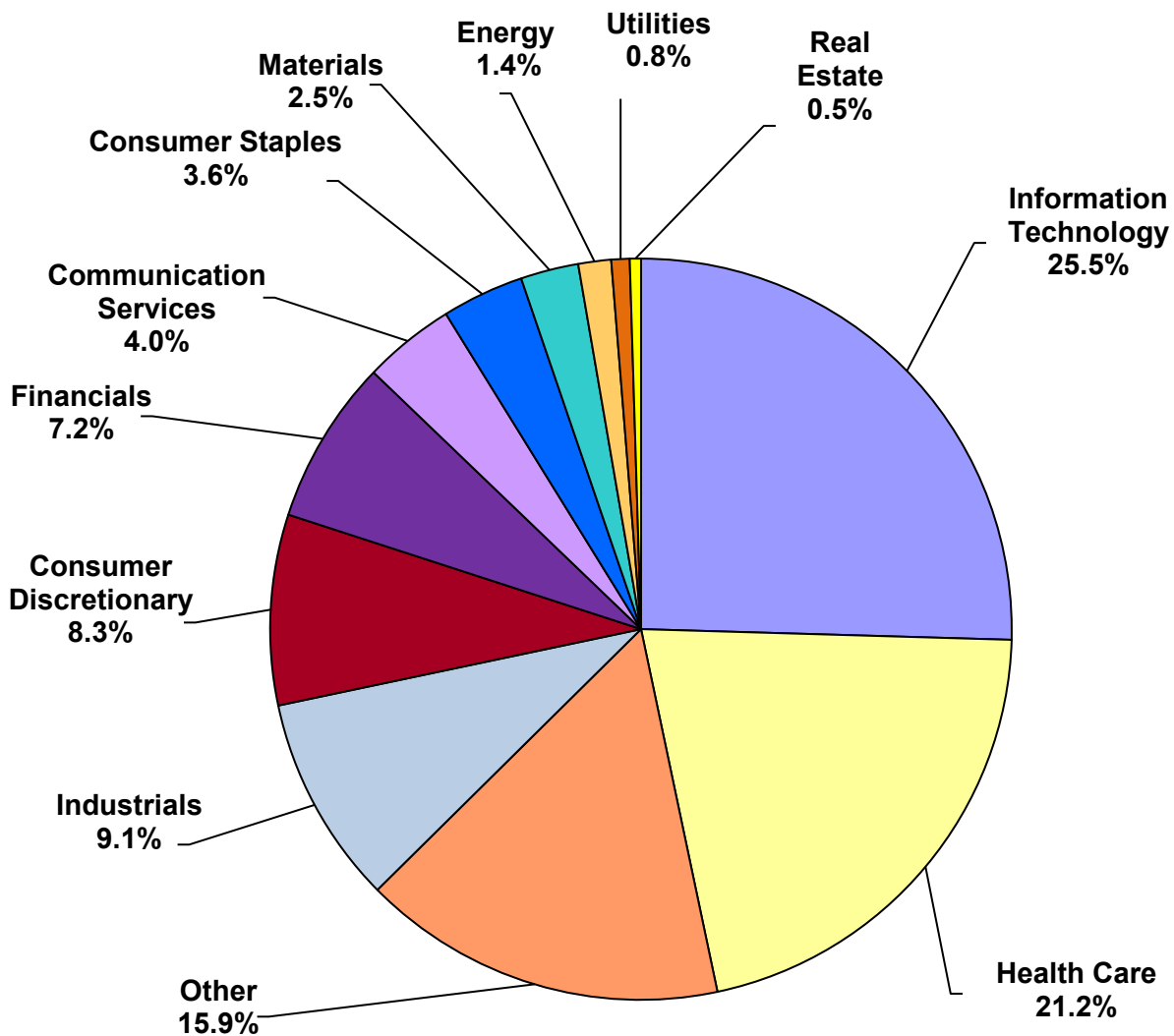


SMRS

Private Equity

12/31/22

Investments by Industry

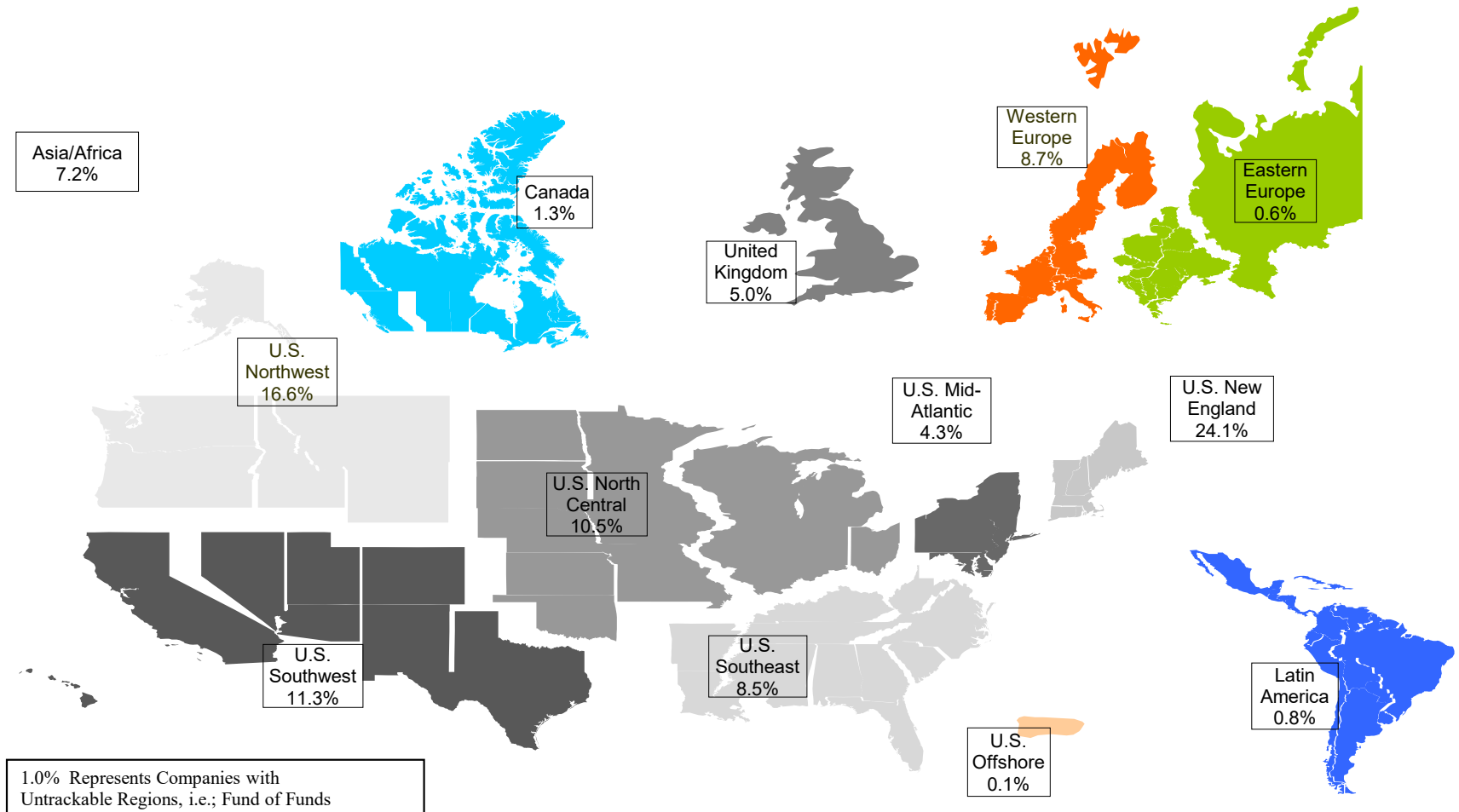


These numbers are based on the most recent available General Partner Data; primarily 9/30/22 and are subject to change.

SMRS Private Equity

12/31/22

Investments by Region



Geographic Report: North America 77.5%, Europe 14.3%, Asia 7.2%, Other 1.0%

SMRS Private Equity

12/31/22

Portfolio by Vintage Year

(\$ in Millions)

Asset Vintage	Reported Value	Outstanding Commitment	Total Exposure
1986-2005	\$ 207	\$ 57	\$ 264
2006*	73	87	160
2007	69	41	110
2008	204	69	273
2009	11	0	11
2010	133	3	136
2011	388	53	441
2012	564	41	605
2013	113	42	155
2014	1,161	113	1,274
2015	8,145	1,174	9,319
2016	2,109	209	2,318
2017	1,864	233	2,097
2018	3,378	1,267	4,645
2019	1,948	500	2,448
2020	815	430	1,245
2021	894	1,901	2,795
2022	130	2,074	2,204
Income Accruals	(0)	0	(0)
Cash	168	0	168
Act. Small Cap - Stock Dist	9	0	9
Total	\$ 22,383	\$ 8,294	\$ 30,677

*Liquidation portfolio is 2006 vintage

FX Exposure

(\$ in Millions)

	Reported Value	Outstanding Commitment	Total Exposure	Total (USD)
Euro (\$1.067/ €)	€ 438	€ 206	€ 645	\$688

SMRS

Private Equity

12/31/22

Top 10 Sponsors

(\$ in Millions)

Asset Type	Reported Value	Outstanding Commitment	Total
HarbourVest Partners	\$ 7,450	\$ 1,564	\$ 9,014
Advent International	714	427	1,141
StepStone Group	573	484	1,057
Insight Partners	879	75	954
Veritas Capital	665	252	917
Thoma Bravo	597	303	900
Flagship Pioneering	673	186	859
Leonard Green & Partners	699	155	854
KKR	668	169	837
The Carlyle Group	500	312	812
Top 10 Total Value	\$ 13,418	\$ 3,927	\$ 17,345

Cash Weighted Rates of Return*

(Net IRR)	Current Qtr.	1-Year	3-Year	5-Year	10-Year
Buyout	-1.4%	-2.7%	21.8%	19.8%	18.4%
Fund of Funds	-5.4%	1.5%	17.7%	16.1%	15.2%
Special Situations	-2.8%	-2.5%	18.2%	14.1%	13.1%
Venture Capital	-4.6%	-18.5%	29.0%	24.7%	21.3%

*These numbers are based on most recent available General Partner reported data; primarily 9/30/2022 and are subject to change.

SMRS

Private Equity

12/31/22

Net Market Values by Ownership Entity

	<u>Adjusted Reported Value</u>	<u>Unfunded Commitment</u>
5AM Opportunities I, LP	\$ 22,151,681	\$ 0
5AM Opportunities II, LP	8,541,700	17,000,000
5AM Ventures VI, LP	27,935,563	750,000
5AM Ventures VII, LP	3,123,848	20,937,500
Accel Europe I, LP	1,172,870	1
Accel Europe II, LP	24,536,339	3,300,000
Accel Growth Fund II, LP	11,310,359	0
Accel Growth Fund III, LP	15,285,125	280,000
Accel Growth Fund IV, LP	33,728,180	0
Accel Growth Fund V L.P	44,306,312	843,751
Accel Growth Fund VI, LP	11,659,471	12,875,000
Accel India VII, LP	1,929,454	7,875,000
Accel IX, LP	1,586,181	3,000,000
Accel Leaders 4, LP	0	50,000,000
Accel Leaders Fund 3, LP	29,282,167	8,800,000
Accel Leaders Fund II, LP	12,632,138	0
Accel Leaders Fund, LP	12,086,575	0
Accel London V, LP	50,388,369	1,080,000
Accel London VI, LP	16,535,586	3,000,000
Accel London VII, LP	4,657,937	7,750,000
Accel VI-S, LP	1,830,753	652,611
Accel VI, LP	639,140	0
Accel X, L.P.	5,897,554	0
Accel XI, LP	8,483,488	1,440,000
Accel XII, LP	23,671,100	980,000
Accel XIII, LP	22,738,594	1,250,000
Accel XIV, LP	14,818,170	1,150,000
Accel XV, LP	3,704,433	6,300,000
Accel-KKR Growth Capital Fund IV, LP	8,293,796	30,830,889
Acorn Bioventures 2, LP	16,050,167	85,000,000
Acorn Bioventures, LP	72,574,255	10,000,000
Advent Global Private Equity V, LP	3,504,800	8,700,000
Advent International GPE IX, LP	315,855,140	32,481,966
Advent International GPE VI-A, LP	17,095,048	0
Advent International GPE VII-B, LP	41,191,158	8,000,000
Advent International GPE VIII-B, LP	264,359,292	0

	Adjusted Reported Value	Unfunded Commitment
Advent International GPE X, LP	10,167,353	337,750,000
Advent International LAPEF VII, LP	24,491,526	37,050,000
Advent Latin American Private Equity Fund VI, LP	37,554,129	2,450,000
Affinity Asia Pacific Fund III, LP	12,602,069	8,520,204
Affinity Asia Pacific Fund IV, LP	45,502,677	15,398,474
Affinity Asia Pacific Fund V, LP	86,298,387	89,802,799
Apax Digital II, LP	3,729,007	96,270,993
Apax Digital, LP	50,823,732	11,386,613
Apax Europe Fund VI, LP	7,652,601	2,257,018
Apax Europe VII, LP	2,365,288	1,589,541
Apax IX, LP	146,642,331	14,420,230
Apax US VII, LP	2,415,773	417,509
Apax VIII - B, LP	25,425,264	3,983,093
Apax X USD, LP	124,954,146	38,679,605
Apax XI USD, L.P.	0	150,000,000
Apollo Investment Fund IX, LP	85,854,850	32,077,558
Apollo Investment Fund VIII LP	38,964,120	11,273,742
Arboretum Ventures II, LP	993,026	0
Arboretum Ventures III, LP	5,242,993	0
Arboretum Ventures IV, LP	26,231,586	6,150,000
Arboretum Ventures V, LP	25,939,266	11,795,000
Arboretum Ventures VI, LP	193,252	34,772,500
Ares Corporate Opportunities Fund II, LP	172,246	11,423,773
Ares Corporate Opportunities Fund III, LP	1,306,318	6,656,978
Ares Corporate Opportunities Fund IV, L.P	37,591,066	13,701,239
ASF VIII B	97,801,293	74,566,451
AXA ASF Miller Co-Investment	271,633	0
Axiom Asia 6, LP	18,413,022	33,000,000
Axiom Asia Co-Investment Fund I, LP	55,764,233	6,031,825
Axiom Asia Co-Investment Fund II, LP	18,048,782	31,869,177
Axiom Asia IV, LP	56,785,645	7,497,811
Axiom Asia Private Capital Fund III, LP	51,570,437	5,250,002
Axiom Asia V, LP	49,368,616	12,750,000
BC European Capital VII, LP	593,011	0
Berkshire Fund IX Coinvestment Fund, LP	49,590,628	8,968,361
Berkshire Fund IX, LP	207,555,298	14,081,435
Berkshire Fund VI, LP	21,403,946	6,902,067
Berkshire Fund VII, LP	5,814,560	2,441,522
Berkshire Fund VIII, LP	82,619,949	12,028,238
Berkshire Fund X, LP	50,334,442	103,952,453
Blackstone Capital Partners IV, LP	494,413	4,580,765
Blackstone Capital Partners V, LP	1,724,360	13,069,138
Blackstone Capital Partners V-S, LP	0	712,476
Blackstone Capital Partners VI, LP	111,693,493	33,525,682
Blackstone Capital Partners VII, LP	272,055,337	19,328,680
Blackstone Capital Partners VIII, LP	109,012,209	112,072,732

	Adjusted Reported Value	Unfunded Commitment
Blackstone Growth II, LP	0	100,000,000
Carlyle Europe Partners V, SC SP	78,350,684	62,123,619
Carlyle Partners Growth, LP	2,755,860	46,828,291
Carlyle Partners V, LP	19,232,253	10,645,569
Carlyle Partners VI, LP	91,837,449	9,288,430
Carlyle Partners VII, LP	280,764,849	12,807,393
Carlyle Partners VIII, LP	27,089,428	170,151,563
Charlesbank Equity Fund IX, LP	104,525,996	10,700,287
Charlesbank Equity Fund X, LP	43,633,802	58,052,879
Charlesbank Equity Overage Fund X, LP	38,726,154	13,891,224
Charlesbank Fund IX Overage Allocation Program	50,139,909	9,298,010
Clearlake Capital Partners VII, LP	80,900,639	117,942,115
Coller International Partners V, LP	710,261	2,000,000
Coller International Partners VI, LP	16,518,021	5,000,000
Coller International Partners VII, LP	83,351,689	45,871,272
CVC Capital Partners VII, LP	243,976,929	12,993,186
CVC Capital Partners VIII, LP	66,729,338	45,222,259
Dover Street IX, LP	64,329,494	13,000,000
Dover Street X, LP	113,782,105	55,125,000
FirstMark Capital I, LP	72,819,785	196,596
FirstMark Capital IV, LP	80,351,930	1,400,000
FirstMark Capital OF I, LP	18,286,714	0
FirstMark Capital OF II, LP	71,514,009	0
FirstMark Capital OF III, LP	36,524,026	0
FirstMark Capital OF IV, LP	0	35,000,000
FirstMark Capital V, LP	30,188,633	12,600,000
FirstMark Capital VI, LP	0	35,000,000
Flagship Pioneering Fund VII, LP	40,718,592	163,000,000
Flagship Pioneering Special Opportunities Fund II, LP	95,589,248	19,000,000
Flagship Pioneering VI, LP	302,930,666	3,750,000
Flagship Ventures Fund 2004, LP	7,004	0
Flagship Ventures Fund 2007, LP	3,352,049	0
Flagship Ventures Fund IV, LP	106,569,613	0
Flagship Ventures Fund V, LP	83,980,853	0
Flagship Ventures Opportunities Fund I, LP	40,211,906	0
GCM Grosvenor Fund Investment Program I, LP	4,535,613	1,469,748
GCM Grosvenor Fund Investment Program II, LP	17,593,469	12,818,284
GCM Grosvenor Fund Investment Program III - 2004	27,079,550	4,202,446
GCM Grosvenor Fund Investment Program III - 2006	26,385,918	6,546,450
GCM Grosvenor Fund Investment Program V, LP	36,543,385	8,547,072
GCM Grosvenor Fund Investment Program VI, LP	23,329,342	1,875,942
GCM Grosvenor Fund Investment Program VIII, LP	107,492,071	10,703,634
GCM Grosvenor SeasPriFIP LP (PIS06-10)	19,452,408	7,511,130
GCM Grosvenor SeasPriFIP LP (PIS14)	298,968,820	15,691,311
GCM Grosvenor SeasPriFIP LP (Seed)	8,695,546	17,093,149
Genstar Capital Partners IX, LP	97,000,897	11,467,603

	Adjusted Reported Value	Unfunded Commitment
Genstar Capital Partners VIII, LP	85,049,764	4,342,893
Genstar Capital Partners X, LP	51,718,288	49,967,470
Genstar IX Opportunities Fund I, LP	58,511,799	8,926,766
Genstar VIII Opportunities Fund I, LP	73,204,982	3,694,388
Genstar X Opportunities Fund I, LP	15,124,759	10,401,104
Golden Bell Azalea, LLC	28,204,024	0
Green Equity Investors V, LP	6,347,848	14,745,120
Green Equity Investors VI, LP	126,187,688	7,539,937
Green Equity Investors VII, LP	259,651,158	49,345,044
Green Equity Investors VIII, LP	231,996,245	34,151,326
Greenspring Master G, LP	532,096,980	480,000,000
Greenspring Micro II, LP	41,394,168	3,500,000
GTCR Fund XIII, LP	25,328,122	24,427,247
* GTCR Fund XIV, LP	0	150,000,000
GTCR Strategic Growth Fund, LP	789,748	41,169,750
HarbourVest Dover Street VIII, LP	7,828,058	5,400,000
HarbourVest Int'l III Partnership, LP	140,221	1,200,000
Harbourvest Partners Co-Investment Fund IV, LP	74,373,425	19,107,835
HarbourVest Partners Co-Investment Fund V, LP	227,644,866	45,000,000
Harbourvest Partners Co-Investment Fund VI, LP	49,169,091	150,000,000
HarbourVest V Partnership, LP	122,307	300,000
HarbourVest VI - Direct Fund, LP	347,086	750,000
HarbourVest VI Partnership, LP	244,898	2,000,000
Harvest Partners IX, LP	12,651,647	85,551,481
Harvest Partners VII, LP	113,337,012	7,759,791
Harvest Partners VIII, LP	122,644,875	10,949,988
Hellman & Friedman Capital Partners X, LP	49,058,846	45,311,166
Hg Saturn 3 A, LP	252,055	99,241,096
Insight Partners Fund X Follow-On Fund, LP	33,538,138	10,000,000
Insight Partners XI, LP	155,241,074	2,731,846
Insight Partners XII, LP	83,433,834	51,000,000
Insight Venture Partners Growth-Buyout Coinvestment	122,134,919	4,528,070
Fun Insight Venture Partners IX, LP	278,912,969	1,895,805
Insight Venture Partners X, LP	205,751,799	4,941,247
Jade Equity Investors, LP	74,282,934	49,675,511
Kelso Investment Associates IX, LP	51,541,096	9,589,631
Kelso Investment Associates VII, LP	150,130	0
Kelso Investment Associates VIII, LP	7,545,451	7,765,714
Kelso Investment Associates X, LP	142,856,911	22,947,374
Khosla Ventures III, LP	10,463,595	225,000
Khosla Ventures IV, LP	80,966,118	950,000
Khosla Ventures Opportunity I, LP	19,638,836	7,100,000
Khosla Ventures Seed D, LP	21,202,289	940,000
Khosla Ventures Seed E, LP	3,797,273	1,900,000
Khosla Ventures V, LP	100,950,709	1,750,000
Khosla Ventures VI, LP	129,143,933	3,750,000

	Adjusted Reported Value	Unfunded Commitment
Khosla Ventures VII, LP	32,682,028	19,500,000
KKR 2006 Fund, LP	877,523	6,102,869
KKR Americas Fund XII, LP	246,120,410	23,471,876
KKR Asian, LP	277,524	395,007
KKR Asian Fund II, LP	23,215,288	0
KKR Asian Fund III, LP	112,052,420	16,779,247
KKR China Growth Fund, LP	8,837,797	3,306,040
KKR European Fund II, LP	1,059,490	0
KKR European Fund III, LP	2,759,014	6,430,608
KKR European Fund IV, LP	81,596,597	0
KKR European Fund V (USD) SCSp	107,655,866	21,374,667
KKR Millennium Fund, LP	232,956	0
KKR North America Fund XI, LP	50,281,429	1,336,247
KKR North America Fund XIII SCSp	33,395,330	89,775,212
Lead Edge Capital IV, LP	30,661,185	9,326,779
Lead Edge Capital V, LP	25,524,144	5,792,358
Lead Edge Capital VI, LP	7,275,024	67,488,520
Lightspeed India Fund IV, LLC	23,744	7,455,000
Lightspeed Opportunity Fund II, LP	3,207,195	21,750,000
Lightspeed Opportunity Fund, LP	34,186,052	500,000
Lightspeed Venture Partners Select IV, LP	29,041,826	2,750,000
Lightspeed Venture Partners Select V, LP	5,324,615	19,000,000
Lightspeed Venture Partners VII, LP	4,496,409	0
Lightspeed Venture Partners XIII, LP	15,839,815	1,200,000
Lightspeed Venture Partners XIV-A, LP	3,630,467	7,425,000
Lightspeed Venture Partners XIV-B, LP	3,457,117	10,037,500
Menlo Special Opportunities Fund II, LP	42,934,941	2,100,000
Menlo Special Opportunities Fund III, LP	4,003,763	20,750,000
Menlo Ventures IX, LP	1,128,357	0
Menlo Ventures X, LP	2,300,178	0
Menlo Ventures XI, LP	15,215,128	0
Menlo Ventures XIV, LP	16,242,320	0
Menlo Ventures XV, LP	19,413,508	7,500,000
Meritech Capital Partners Franchise Fund, LP	3,882,420	10,987,500
Meritech Capital Partners IV, LP	2,323,585	0
Meritech Capital Partners V, LP	18,169,224	400,000
Meritech Capital Partners VI, LP	44,800,833	2,656,250
Meritech Capital Partners VII, LP	24,221,124	20,400,000
Meritech Capital Partners VIII, LP	0	48,000,000
Meritech Capital Sidecar III, LP	0	12,000,000
Michigan Growth Capital Partners II, LP	99,928,051	168,982
Michigan Growth Capital Partners III, LP	111,890,140	22,174,276
Michigan Growth Capital Partners IV, LP	25,848,248	52,295,837
Michigan Growth Capital Partners, LP	18,621,342	6,015,687
Michigan SEMF Barings	46,289,944	108,228,456
Michigan SEMF Grosvenor	36,160,955	116,100,373

	Adjusted Reported Value	Unfunded Commitment
New Leaf Biopharma Opportunities II, LP	113,662,286	8,000,000
New Leaf Growth Fund I, LP	41,227,402	0
New Leaf Ventures II, LP	4,829,168	0
New Leaf Ventures III, LP	35,839,631	0
New Leaf Ventures IV, LP	58,246,699	17,000,000
Oak Investments Partners IX, L.P.	15,902	0
Ocqueoc Holdings, LLC	825,115	47,610,356
Odyssey Investment Partners Fund VI, LP	86,140,062	33,148,377
Permira Growth Opportunities I, L.P.1	37,071,613	13,244,666
Permira Growth Opportunities II SCSp	8,318,152	37,875,000
Permira VII L.P. 1	68,148,826	16,089,600
Permira VIII, L.P. 2	0	80,043,751
Public Pension Capital, LLC	100,374,967	27,502,715
Renaissance Venture Capital Fund IV, LP	7,373,320	17,500,000
Riverside Capital Appreciation Fund VI, LP	20,671,298	9,482,715
Riverside Capital Appreciation Fund VII, LP	89,212,360	29,330,760
Riverside Micro Cap Fund I, LP	10,947,049	4,096,758
Riverside Micro-Cap Fund II, LP	1,404,427	2,735,834
Riverside Micro-Cap Fund III, LP	77,720,378	4,823,424
Riverside Micro-Cap Fund IV, LP	83,236,922	3,617,302
Riverside Micro-Cap Fund IV B, LP	25,378,831	713,421
Riverside Micro-Cap Fund V, LP	117,313,421	19,388,317
Riverside Micro-Cap Fund VI, LP	7,474,450	116,697,563
Science Ventures Fund II, LP	42,882,768	1,500,000
Science Ventures Fund III, LP	13,319,853	12,500,000
Silver Lake Partners III, LP	6,660,787	11,910,583
Silver Lake Partners IV, LP	72,011,114	1,819,311
Silver Lake Partners V, LP	73,521,389	9,544,536
Silver Lake Partners VI, LP	43,572,820	20,837,073
Silver Lake SL SPV-2	59,343,319	0
SK Capital Partners V, LP	48,961,482	7,793,293
SKCP Catalyst Fund I-A, LP	32,713,029	15,376,434
SMRS - TOPE, LLC	4,791,190,194	597,272,571
SMRS-CAPP, LLC	386,720,170	238,831,651
SMRS-NCRP, LLC	1,734,057,831	436,158,994
Summit Partners Growth Equity Fund X, LP	90,764,988	23,953,260
Summit Partners Growth Equity Fund XI-A, LP	10,519,249	88,672,330
The Veritas Capital Fund VIII, LP	62,249,174	185,479,261
The Veritas Capital Vantage Fund, LP	19,291,872	41,536,099
Thoma Bravo Discover Fund II, LP	96,824,823	22,209,320
Thoma Bravo Discover Fund IV, LP	15,447,852	84,552,148
Thoma Bravo Explore II, LP	0	100,000,000
Thoma Bravo Fund XII, LP	148,616,372	36,904,285
Thoma Bravo Fund XIII, LP	174,917,377	10,504,042
Thoma Bravo Fund XV, LP	53,267,823	46,337,869
Thoma Bravo XIV, LP	108,490,982	2,259,656

	Adjusted Reported Value	Unfunded Commitment
TI Platform BOV, LP	18,774,718	4,069,523
TI Platform Fund II, LP	19,125,906	2,510,196
TI Platform Fund III, LP	6,770,499	18,504,501
TI Platform SMRS SMA, LP	98,241,448	31,426,798
TPG Healthcare Partners II, LP	0	37,500,000
TPG Healthcare Partners, LP	20,696,802	5,010,923
TPG IV, LP (Texas Pacific Group IV)	104,448	211,725
TPG Partners IX, LP	0	112,500,000
TPG Partners VI, LP	15,440,901	7,467,821
TPG Partners VIII, LP	118,029,352	32,447,715
TPG Partners, VII, LP	66,853,001	5,189,296
TPG V, LP (Texas Pacific Group V)	851,563	5,841,509
TSG6, LP	30,679,716	19,167,804
TSG7 A, LP	149,636,580	23,716,522
TSG8, LP	101,022,170	42,120,540
TSG9, LP	0	175,000,000
Veritas Capital Fund V, LP	156,942,155	1,508,273
Veritas Capital Fund VI, LP	199,407,750	14,826,993
Veritas Capital Fund VII, LP	127,415,762	8,653,170
Veritas V Co-Investors, LP	99,968,993	0
Warburg Pincus Global Growth, LP	175,231,612	18,075,000
Warburg Pincus Private Equity IX, LP	76,100	0
Warburg Pincus Private Equity X, LP	6,637,737	0
Warburg Pincus Private Equity XI, LP	73,532,742	0
Warburg Pincus Private Equity XII Secondary, LP	31,561,575	337,500
Warburg Pincus Private Equity XII, LP	220,932,070	2,362,500
Total Private Equity	\$22,205,830,404	\$ 8,294,295,339
Cash	168,395,786	0
Active Small Cap Cash	0	0
Active Small Cap	8,790,702	0
Income Accruals	(1)	0
Grand Total	\$22,383,016,891	\$ 8,294,295,339

Total Private Equity amounts do not include Cash and Active Small Cap

* New Commitments made during quarter reported

State of Michigan Retirement System

REAL ESTATE AND INFRASTRUCTURE REVIEW

State of Michigan Investment Board Meeting
March 23, 2023



Todd A. Warstler
Senior Investment Manager
Real Estate and Infrastructure Division

EXECUTIVE SUMMARY

Performance

MPSERS Plan (12/31/22)	1-Year	3-Years	5-Years	7-Years	10-Years
Annualized Returns	19.6%	10.6%	10.2%	10.0%	11.0%
NCREIF NPI	4.2%	6.7%	6.1%	6.1%	7.4%
Peer Median Returns	8.3%	10.3%	9.2%	9.0%	10.9%

*State Street Universe greater than \$1 billion

- Outperformance relative to the one-year benchmark resulted primarily from the Real Estate and Infrastructure Division's (REID) strategy of being overweight in residential, underweight to office & retail and recovery in the hospitality sector. Over the ten-year timeframe the REID is outperforming the benchmark by 360 basis points.

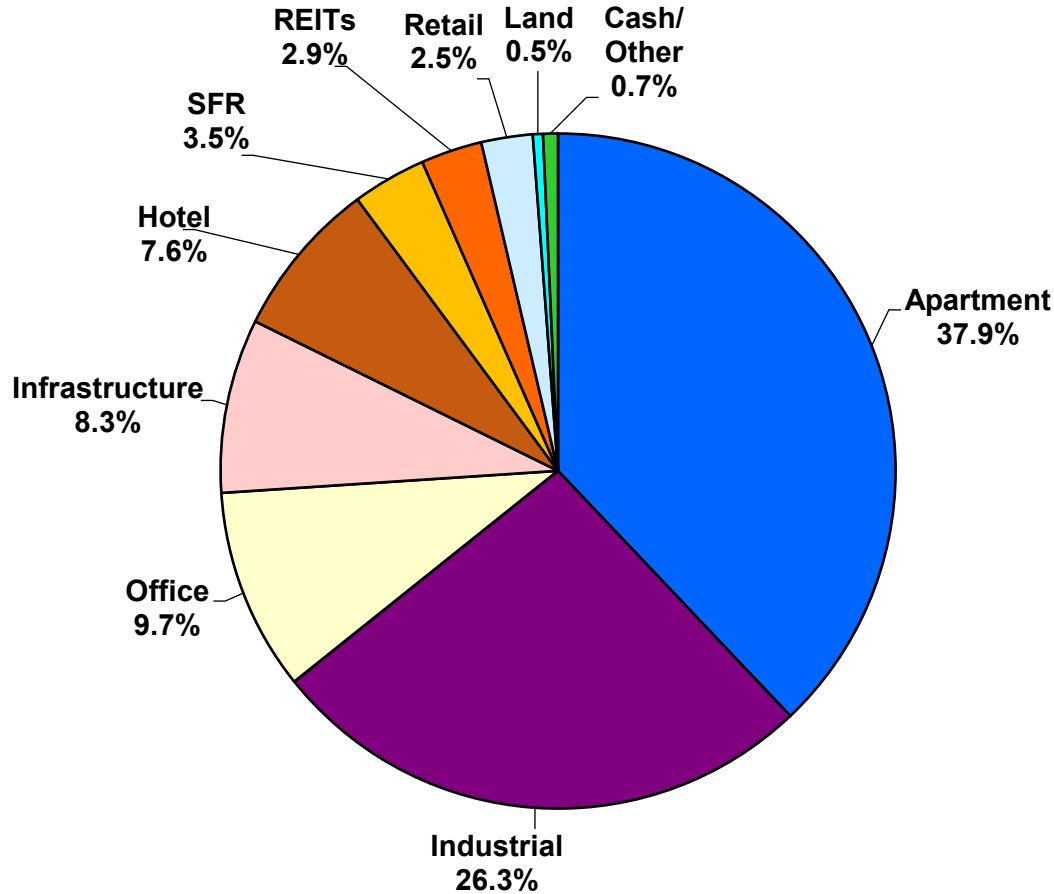
Strategy Update

- The COVID-19 global pandemic has largely receded as a primary concern of the US and world economies. Impacts to commercial markets have been uneven across the real estate and infrastructure sectors with some impacts transitory and others of a more lasting nature. New threats to markets emerged in 2022 including geopolitical tensions, elevated levels of inflation and sharply higher interest rates. We continue to monitor, assess, and shift strategies, as necessary.
- In the real estate space, we are focused on sourcing off-market opportunities through our extensive network and where available reducing risk in the portfolio through early income-generating investments. We have selectively acquired properties where we can add value through management and leasing and have continued to develop properties at attractive risk-adjusted returns. The team continues to assemble portfolios in both traditional and non-traditional real estate sectors that we believe will become institutional property types, providing the potential for above market appreciation and total returns. In the infrastructure space, we continue to focus on diversified strategies and to identify those managers with top performing track records and best in class investment teams, who are pursuing opportunities in sectors we have identified for allocation.
- We have been actively managing the portfolio with capital returned of approximately \$747 million, and funding for new or existing investments of approximately \$2.2 billion over the past 12 months.
- The REID has approximately \$3.2 billion in unfunded commitments. Two new commitments were made during the quarter.
 - \$300 million in Lone Star Fund XII, LP, a closed-end global, diversified fund concentrating on opportunistic debt and equity investments that primarily support the housing sector including investments in financially oriented or other operating companies, managed by Lone Star Management Co. XII, Ltd.
 - \$50 million in Avanath Affordable Housing Renaissance Fund, LP, an open-end fund Investing in affordable multi-family housing in the US. The fund is managed by Avanath Capital Management, LLC

SMRS

Real Estate and Infrastructure

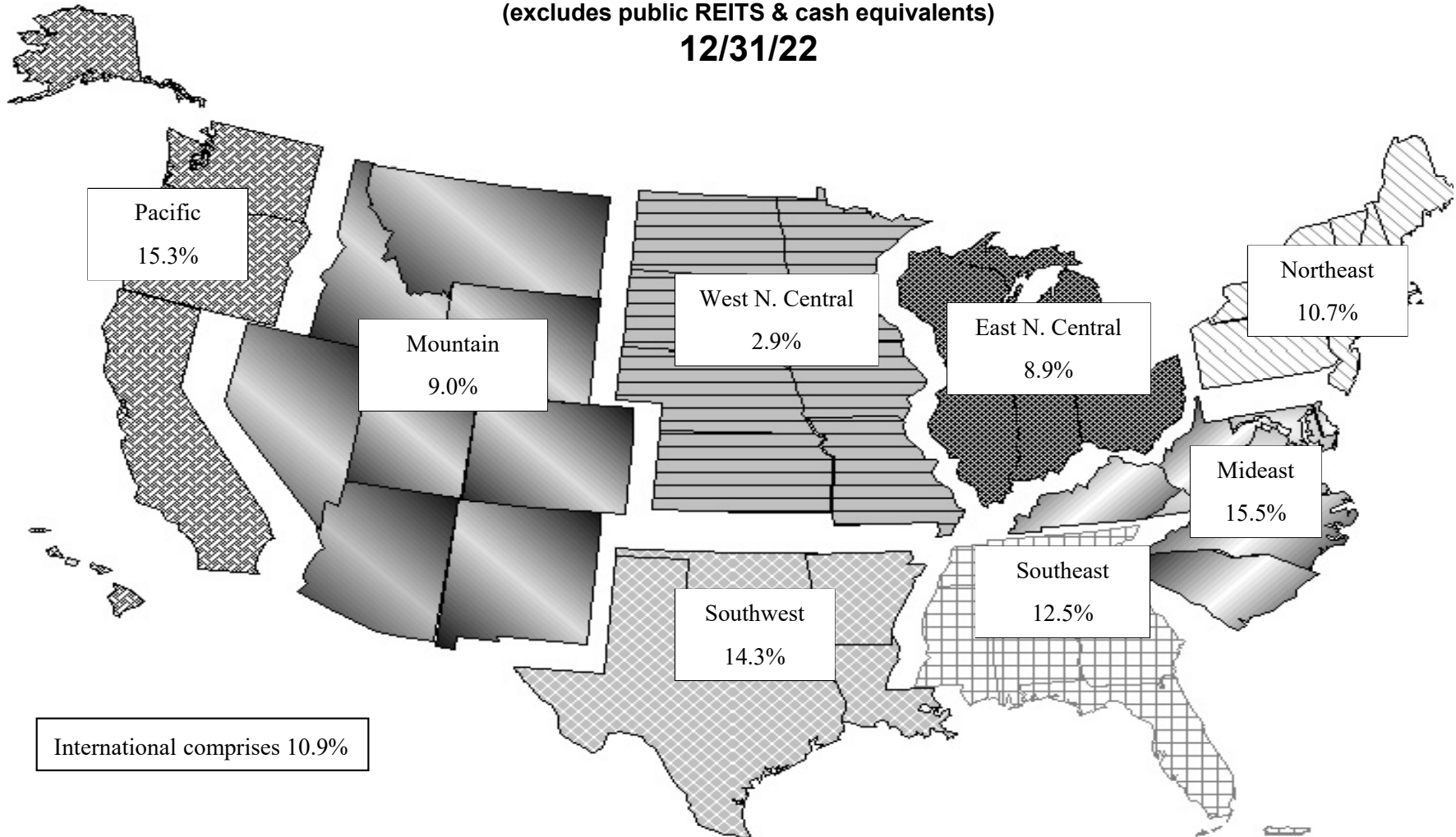
12/31/22



Market Value in Millions

	12/31/22		12/31/21	
Apartment	\$3,803	37.9%	\$3,010	39.0%
Industrial	2,641	26.3%	1,596	20.7%
Office	972	9.7%	606	7.9%
Infrastructure	837	8.3%	714	9.3%
Hotel	759	7.6%	617	8.0%
Single Family Residential (SFR)	355	3.5%	190	2.5%
REITs	295	2.9%	314	4.1%
Retail	247	2.5%	322	4.2%
Land	47	0.5%	67	0.9%
	<u>\$9,956</u>	<u>99.3%</u>	<u>\$7,437</u>	<u>96.4%</u>
Cash/Other	72	0.7%	276	3.6%
Total Investments	<u>\$10,028</u>	<u>100.0%</u>	<u>\$7,713</u>	<u>100.0%</u>

SMRS
Real Estate by Region
Based on Market Value
(excludes public REITS & cash equivalents)
12/31/22



Geographic regions defined by NCREIF, whose property index composition is: Pacific 34.8%, Mountain 7.0%, West N. Central 1.0%, Southwest 10.4%, East N. Central 6.1%, Southeast 11.4%, Northeast 18.6%, Mideast 10.7%

SMRS

Real Estate and Infrastructure

12/31/22

Top Ten Advisors or Entity

<u>Advisor or Entity</u>	(\$ in millions) <u>Market Value</u>
MWT Holdings LLC	\$ 2,977
Principal Real Estate Investors	1,273
Clarion Partners	950
BentallGreenOak	538
Blackstone Group	403
Domain Capital Advisors Inc	335
Five Star Realty Partners LLC	272
Lone Star Global	267
Transwestern Investment Management	231
Heitman Capital Management	197
	<hr/> \$ 7,443 <hr/>

SMRS

Real Estate

12/31/22

Market Values by Ownership Entity

	<u>Market Value</u>	<u>Unfunded Commitment</u>
801 Grand Avenue Capital, LLC	\$ 21,715,197	\$ 0
AEW Senior Housing III	4,071,846	459,867
AEW Senior Housing Investors IV	32,245,302	16,757,844
Apollo Asia Real Estate Fund	65,929,315	22,769,961
Asana Partners Fund I, LP	33,425,900	2,449,559
Asana Partners Fund II, LP	37,610,357	18,405,405
Asana Partners Fund III, LP	5,940,851	92,333,333
Avanath Affordable Housing III	65,040,275	1,291,663
Avanath Affordable Housing IV	34,526,085	1,214,355
* Avanath Affordable Housing Renaissance Fund, LP	24,938,518	25,000,000
BentallGreenOak US Cold Storage, LP	2,440,895	71,281,150
BGO Europe III Co Invest	20,303,871	8,618,228
BentallGreenOak Europe IV, LP	8,587,264	98,629,686
BlackRock MiREIT Fund	97,940,695	0
Blackstone R/E Partners V, LP	455	2,087,026
Blackstone R/E Partners VI, LP	1,401,416	3,680,930
Blackstone R/E Partners VIII, LP	60,940,522	10,701,554
Blackstone R/E Partners IX, LP	229,181,254	39,241,892
Blackstone R/E Partners X, LP	0	200,000,000
Carlyle Realty Partners IX, LP	3,192,388	96,807,612
Creative Media & Community Trust Corp	2,879,799	0
CIM Fund III, LP	30,925,023	0
CIM Fund VIII, LP	82,616,966	0
CIM VI (Urban REIT), LLC	18,203,215	0
Clarion Gables Multifamily Trust, LP	49,033,165	0
Columbus Circle Holdings, LLC	227,638,257	172,296,472
Crown Small Cap Real Estate	9,535,704	3,280,000
DM2501, LLC	14,073,143	26,210,152
Domain GVA-1, LLC	10,177,884	0
Domain Hotel Properties, LLC	292,014,973	0
Eastport Properties, LLC	62,300,141	1,509,551
Gateway Capital Real Estate Fund II, LP	660,958	1,276,875
GreenOak Europe III, LP	53,812,711	28,965,769
Heitman Credit	48,954,462	0
Heitman Global RE Fund II	48,884,967	52,126,829
Heitman MiREIT Fund	99,537,715	0
IDR Core Property Index Fund, LLC	136,047,466	0

	Market Value	Unfunded Commitment
India Property Fund II, LLC	11,101,209	5,897,418
Invesco Mortgage Recovery Feeder Fund	282,321	2,152,585
Invesco Mortgage Recovery Fund II, LP	23,041,014	21,394,854
Invesco Strategic Opportunities III, LP	24,263,948	82,461,385
IPF II Co-Invest, LP	10,473,190	2,168,655
ISO III SMRS Sidecar, LP	21,204,873	60,034,000
JBC Funds North LaSalle, LLC	3,988,532	0
KBS/SM Fund III, LP	226,331	0
KBS/SM Fund IV, LP	103,918,712	0
L-A Saturn Acquisition	58,004,465	250,799
L&B Spartan Holdings	150,845,107	54,377,144
Landmark Real Estate Partners V, LP	176,230	0
LaSalle Asia Opportunity Fund III, LP	1,217,140	0
Lion Industrial Trust	605,876,275	0
Lion Mexico Fund, LP	3,535,338	0
Lombard GVA0016	272,273,420	74,939,253
Lone Star Fund X, LP	83,858,813	21,734,113
Lone Star Fund XI, LP	183,445,059	64,725,759
* Lone Star Fund XII, LP	0	300,000,000
Lubert-Adler Real Estate Fund VII, LP	45,008,131	1,875,000
M1 Westgate ColInvest, LLC	224,553	0
M301W ColInvest, LLC	378,734	0
MERS Acquisitions Ltd.	38,036,315	0
MIP Holdco, LLC	200,165,101	11,004,910
MSREF V - International	446,294	0
MSRESS Fund III Institutional, LP	1,566,181	0
MWT Holdings, LLC	2,977,629,148	0
Northpark Land Associates	39,877,040	4,965,614
Paladin Realty Brazil Investors III (USA), LP	1,345,563	0
Paladin Realty Latin America Investors IV-CI, LP	27,397,876	0
Paladin Realty TB COINV V, LP	10,811,815	0
Penmain Office, LLC	43,303,824	0
Principal MiREIT	97,615,873	0
Principal Separate Account	267,451,386	36,046,645
Proprium RE Spec. Situations Fund, LP	118,115,733	0
Rialto Credit Partnership, LP	8,322,728	0
Rialto Real Estate Fund III-Debt, LP	42,579,351	0
Rialto Real Estate Fund III-Property, LP	29,350,079	0
Rialto Real Estate Fund IV-Debt, LP	63,795,454	32,765,586
SFR CM, LP	79,920,344	25,742,574
SM Brell II, L.P.	782,135	0
SMP Data Center	886,479,626	431,190,917
Stockbridge RE Fund II-C, LP	883,631	0
Strategic II, LLC	458,966,412	5,861,377
TPG RE Finance Trust Inc.	32,756,603	0
TPG Real Estate Partners II	8,172,225	6,560,629
TPG Real Estate Partners III	37,114,490	17,502,379

	Market Value	Unfunded Commitment
TPG Real Estate Partners IV, LP	9,492,046	140,507,954
TSP Fund III	12,585,926	61,027,494
TSP Value & Income Fund II, LP	18,286,868	6,790,952
True North Real Estate Fund III, LLC	22,201,865	5,000,000
Warwick UK Real Estate Fund I	50,000,000	0
	\$ 9,125,524,510	\$ 2,474,373,708
Short-Term Investments and Other	45,903,021	0
Total Real Estate Investments	\$ 9,171,427,531	\$ 2,474,373,708

* New or additional commitment made during the quarter reported

SMRS

Infrastructure

12/31/22

Market Values by Ownership Entity

	<u>Market Value</u>	<u>Unfunded Commitment</u>
Arclight Energy Partners VI, LP	\$ 26,597,953	\$ 7,004,763
Arclight Energy Partners VII, LP	40,894,746	20,295,402
ASF VI Infrastructure B, LP	9,871,768	5,129,033
ASF VII Infrastructure Fund B, LP	24,152,113	8,766,095
ASF VIII Infrastructure Fund B, LP	10,994,999	88,417,118
ASF Como Co-Investment, LP	1,290,440	1,363,718
Basalt Infrastructure Partners, LP	13,917,418	2,219,045
Blackstone Energy Partners, LP	12,090,892	4,728,291
Blackstone Energy Partners II, LP	78,659,870	15,540,808
Blackstone Energy Transition Partners IV, LP	0	100,000,000
Blackstone Green Private Credit Fund III, LP	0	100,000,000
Brookfield Infrastructure Fund II-B, LP	43,358,596	2,847,442
Customized Infrastructure Strategies, LP	10,069,282	4,485,073
Dalmore Capital Fund	55,382,061	0
GCM Grosvenor Infrastructure IP, LP	105,328,712	49,304
GCM Grosvenor CIS II, LP	35,579,735	6,308,274
GCM Grosvenor CIS III, LP	37,905,521	62,406,408
Global E&P Infrastructure Fund II, LP	26,963,860	2,237,661
GSO Energy Select Opportunities Fund, LP	7,298,328	23,025,768
GSO Energy Select Opportunities Fund II, LP	14,417,252	37,181,642
JPMorgan AIRRO India SideCar Fund US, LLC	80,155,673	470,455
JPMorgan AIRRO Fund II	10,732,594	6,800,131
Irradiant Renewables Opportunities Partners	30,991,856	76,954,977
KKR Eagle CoInvest, LP	42,230,809	1,853,268
KKR Global Infrastructure Investors IV, LP	39,899,476	58,547,906
Ridgewood Water & Strategic IF, LP	34,115,358	17,285,314
Ridgewood Water & Strategic IF II, LP	1,453,758	73,546,242
RPEP SMRS Infra II, LLC	13,725,347	0
StonePeak Infrastructure Fund, LP	32,997,810	8,287,899
	<hr/> \$ 841,076,227	<hr/> \$ 735,752,037
Short-Term Investments and Other	15,605,817	0
Total Infrastructure Investments	<hr/> \$ 856,682,044	<hr/> \$ 735,752,037
TOTAL INVESTMENTS	<hr/> \$ 10,028,109,574	<hr/> \$ 3,210,125,746

State of Michigan Retirement System

REAL RETURN & OPPORTUNISTIC REVIEW

State of Michigan Investment Board Meeting
March 23, 2023



Travis L. Haney, CFA, CAIA
Senior Investment Manager
Real Return & Opportunistic Division

EXECUTIVE SUMMARY

Performance

MPSERS Plan (12/31/22)	1-Year	3-Years	5-Years	7-Years	10-Years
Real & Opportunistic	14.7%	15.6%	14.8%	13.1%	13.1%
Custom Benchmark	8.3%	7.8%	7.5%	7.5%	7.4%

- The portfolio value is \$11.1 billion with a one-year return of 14.7%. As markets rebounded in the fourth quarter of 2022, the valuation of our portfolio holdings was slightly up.
- Performance for the year was driven by i) income earned from entertainment royalties, investments in asset managers, and natural resource strategies; and ii) capital appreciation of our natural resources and media and entertainment assets.

Strategy Update

- The objective of the Real Return & Opportunistic portfolio is to provide an inflation hedge and/or to gain exposure to attractive opportunities that may not fit in another plan portfolio.
- During the quarter, the Real Return & Opportunistic portfolio continued to benefit from exposure to assets with low equity beta and diversity of strategy, industry, and geography.
- The Real Return & Opportunistic portfolio has approximately \$3.3 billion of unfunded commitments. No new commitments were closed during the quarter.
- In addition to monitoring the impact of COVID-19 and pace of economic recovery, staff remains focused on finding differentiated strategies that are additive to the current portfolio mix and continues to favor niche private markets strategies with some scalability. Opportunities that have defensible, contractual cash flows and offer structural downside protection, specifically those with experienced investment teams and proven track records, are preferred.

SMRS

Real Return and Opportunistic

12/31/22

Top Ten Advisors or Entities

(\$ in Millions)

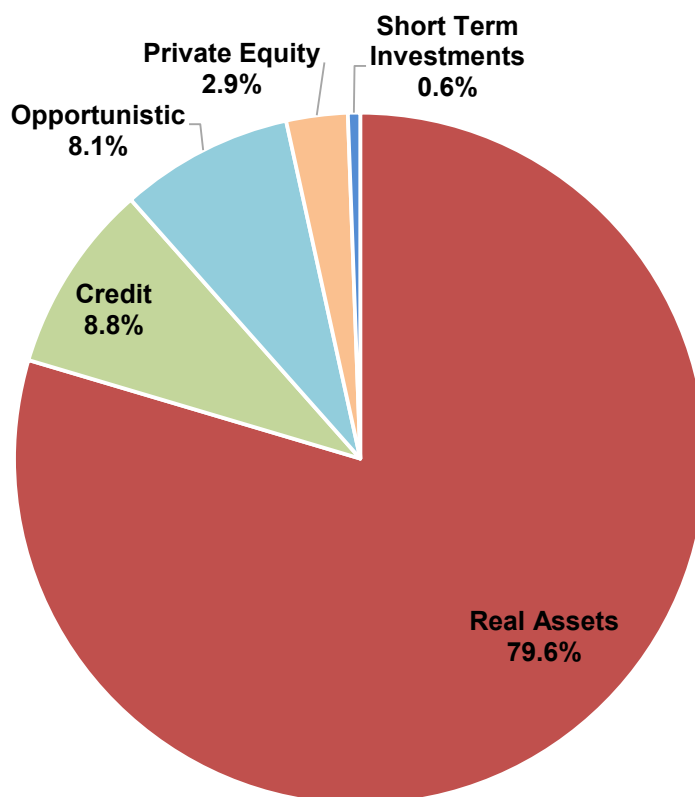
<u>Advisor or Entity</u>	<u>Market Value</u>
Great Mountain Partners	\$ 7,654
Domain Capital Group, LLC	885
Sixth Street Partners	563
Apollo Global Management	439
Blackstone Group	380
Blackstone Alternative Asset Management	258
Clearlake Capital Group	160
Broadriver	150
BlackRock	135
Sycamore Partners	79
Total Market Value	\$ 10,703

SMRS

Real Return and Opportunistic

12/31/22

Investments By Strategy



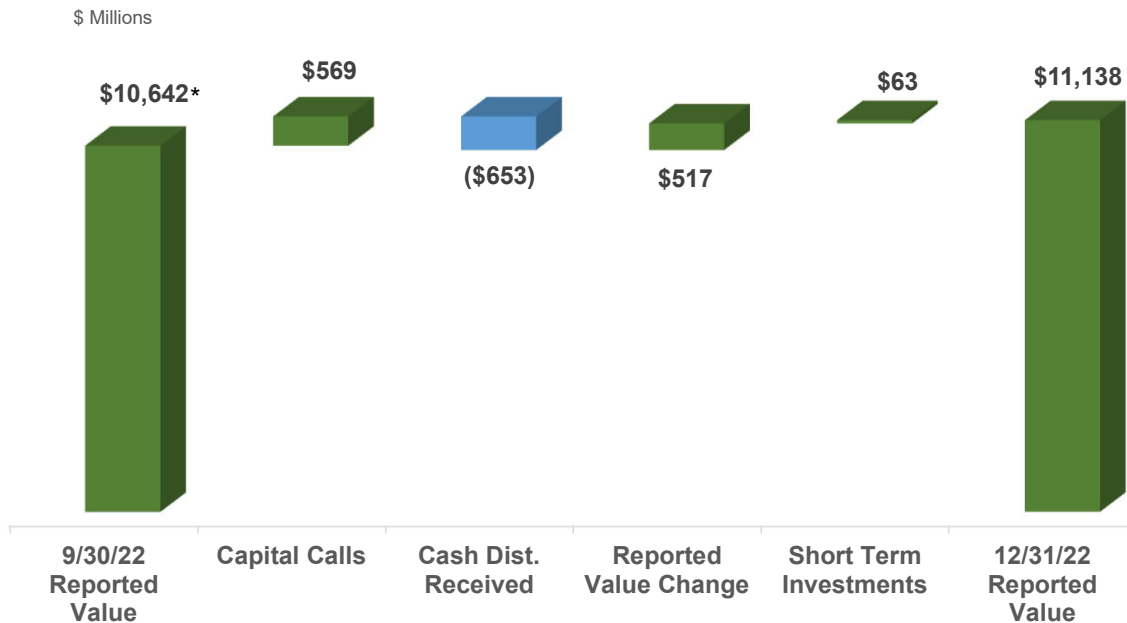
Market Value in Millions	
	<u>12/31/22</u>
Real Assets	\$8,866
Credit	\$987
Opportunistic	\$902
Private Equity	\$320
Short Term Investments	<u>\$63</u>
Total Investments	<u><u>\$11,138</u></u>

SMRS

Real Return and Opportunistic

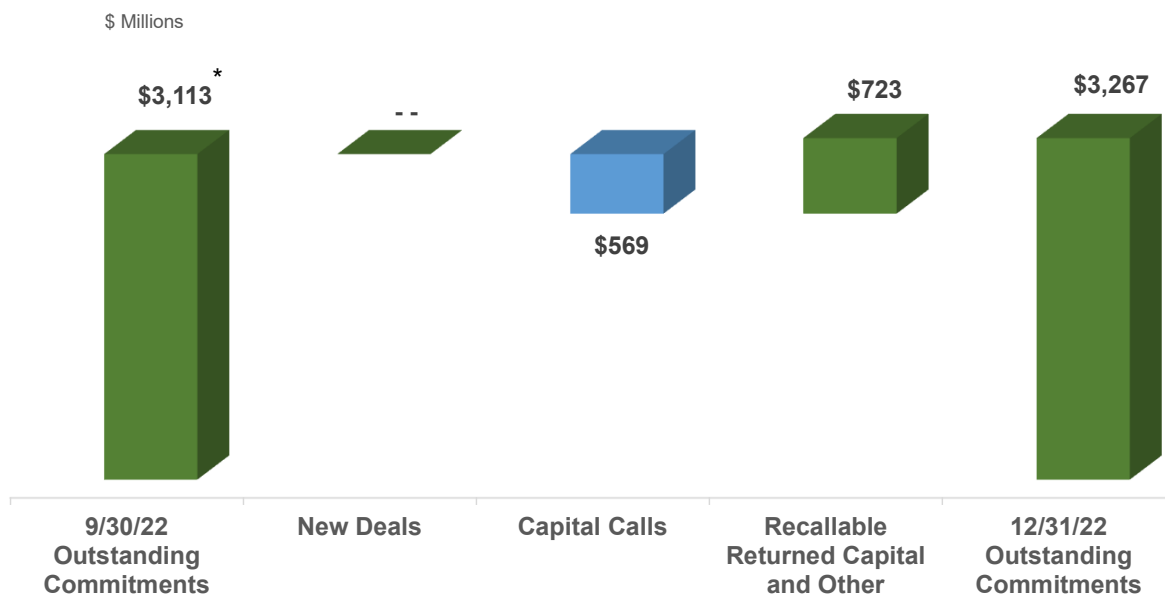
12/31/22

Invested Commitments



* Excludes investments transferred from RROD to ARD for better strategic alignment.

Outstanding Commitments



* Excludes investments transferred from RROD to ARD for better strategic alignment.

SMRS

Real Return and Opportunistic

12/31/22

Net Market Value by Entity

	Net Market Value	Unfunded Commitment
* Abernathy Fund I, LLC	\$ 260,603,752	\$ 4,948,241
* Abernathy Fund II, LP	11,851,652	12,089,046
American Industrial Partners VII, LP	71,440,276	20,608,647
Apollo Financial Credit Investments Fund II, LP	238,580,644	265,946,931
Apollo Financial Credit Investments Fund III, LP	200,309,526	208,310,012
Axton Holdings, LLC	3,466,978,597	0
Blackstone Strategic Capital Holdings (Side Car), LP	98,712,483	4,015,265
Blackstone Strategic Capital Holdings II, LP	127,611,097	135,680,045
Blackstone Strategic Capital Holdings, LP	130,687,339	22,319,916
Blue Peninsula Fund, LP	134,990,186	16,103,348
BroadRiver III, LP	150,346,857	59,871,863
BSCH Parallel (MLG) I, LP	280,997,023	0
Centerbridge Capital Partners III, LP	73,630,848	6,140,418
CircleUp Credit Fund I, LP	20,425,359	900,364
Clearlake Capital Partners VI, LP	105,470,117	2,094,019
Clearlake Opportunities Partners II, LP	43,788,588	29,121,931
Clearlake Opportunities Partners III, LP	10,996,558	88,955,497
Content Holdings, LLC	307,272,187	28,354,311
Energy Transition Holdings, LLC	1,472,340,235	0
Green Equity Investors IX, LP	0	275,000,000
Green Range Holdings, LLC	2,575,849,613	1,064,490,644
Hopen Life Sciences Fund II, LP	4,104,802	365,000
Jade Equity Investors II, LP	0	150,000,000
Nyanza I, LLC	0	2,222
Nyanza II, LLC	138,357,947	158,383,297
* Renaissance Venture Cap Fund II, LP	28,567,336	0
* Renaissance Venture Cap Fund III, LP	30,294,821	4,250,000
Shamrock Capital Content Fund I, L.P	27,642,820	36,375,428
Sixth Street Agriculture Partners I, LP	72,766,622	33,638,146
Sixth Street Growth Partners (A), LP	248,125,965	81,337,300
Sixth Street Growth Partners II (A), LP	16,174,785	182,702,178
Sixth Street TAO Partners (B), LP	226,296,986	117,798,354
* Social Network Holdings, LLC	305,479,486	5,590,289
Sycamore Partners III, LP	79,352,082	39,548,763
TPG Rise Climate, LP	41,745,232	204,661,833
Vida Insurance Credit Opportunity Fund II, LP	73,579,949	7,464,742
Total Real Return and Opportunistic	\$ 11,075,371,769	\$ 3,267,068,051
Short-Term Investments & Other	63,032,761	
Grand Total	\$ 11,138,404,531	\$ 3,267,068,051

* Fund of Funds

** New Commitment

State of Michigan Retirement System

ABSOLUTE RETURN REVIEW

State of Michigan Investment Board Meeting
March 23, 2023



Daniel J. Quigley
Senior Investment Manager
Absolute Return Strategy

EXECUTIVE SUMMARY

Performance

MPSERS Plan (12/31/22)	1-Year	3-Years	5-Years	7-Years	10-Years
Absolute Return	2.9%	7.4%	6.2%	5.7%	5.8%
HFRI FOF Conservative	0.0%	4.8%	3.8%	3.4%	3.7%

- The value of the Absolute Return portfolio is \$9.3 billion with a one-year return of 2.9%. The portfolio performance was positive for the year despite negative performance for both equities and fixed income markets. All underlying strategies contributed to performance.
- Private Credit was a large driver of positive returns for the year, with senior credit, mortgage, and housing related exposures driving performance. Performance in structured credit and aviation were also positive.
- In the Hedge Fund portfolio, core managers in the Multi-Strategy sleeve of the portfolio served as an effective diversifier. This was due to a combination of non-directional exposures across asset classes. Special Situations investments also contributed positive performance as managers were able to take advantage of market dislocations and utilize active portfolio hedge positions.
- The Hedge Fund Macro managers did well as they were able to take advantage of market volatility and profited from higher rates and a stronger dollar. Equities were flat, as L/S equity managers generated negative absolute returns with mixed alpha. Quant equity managers, on the other hand, contributed positively, benefitting from increased and sustained volatility and dispersion.
- Insurance-related investments were mixed as the portfolio experienced negative performance in event driven strategies which was offset by positive performance in equity-oriented insurance positions.

Strategy Update

- The objective of the Absolute Return portfolio is to diversify the total plans' holdings, targeting returns above investment-grade fixed income with lower volatility than the equity portfolio. The portfolio utilizes a diverse mix of managers that invest both long and short to target specific exposures and seek to hedge out unwanted risk.
- There were no new commitments made during the quarter.
- In terms of allocation priorities, we will continue to increase exposure to high quality hedge fund alternatives in order to preserve portfolio liquidity. We will also review credit strategies on an opportunistic basis.

Overall, we will continue to focus on opportunities that seek to provide diversification, protect the downside, and deliver absolute return.

SMRS

Absolute Return Strategies

12/31/22

	Amount	Total	% of Total
Hedge Funds (\$ in Millions)			
Multi-Strategy & Event	\$4,631		
Equity	437		
Credit	3		
Total Hedge Funds		\$5,071	54.3%
Private Credit			
Direct Lending	\$2,499		
Asset Backed	798		
Special Situations & Distressed	712		
Mezzanine	235		
Total Private Credit		\$4,243	45.4%
Cash			
Cash		\$25	0.3%

Total Absolute Return

\$9,339

100.0%

Note: Totals may not be exact due to rounding.

SMRS

Absolute Return

12/31/22

Net Market Value by Entity

	<u>Net Market Value</u>	<u>Unfunded Commitment</u>
* Tahquamenon Fund, LP	\$ 4,622,201,097	\$ 0
Blue Range Holdings LLC	724,691,332	300,000,000
Acacia Coinvest, LP	327,456,811	0
Apollo MidCap FinCo Holdings, LTD	322,329,768	0
SJC Onshore Direct Lending Fund IV-SMRS LP	290,182,916	120,585,401
HPS Red Cedar Fund, LP	280,374,348	142,221,581
Cerberus Manitou Residential Loan Fund, LP	203,791,936	58,580,645
Apollo Accord+	162,710,893	131,341,220
Castle Credit SMRS Holdings, LLC	153,272,022	81,739,828
Sixth Street Lending Partners	133,560,642	365,991,233
Fortress FCO MA MI, LP	123,846,575	28,480,230
Irradiant Solutions Fund, L.P. (fka Kayne)	112,940,886	128,951,656
Jana Strategic Investment Fund IV, LP	109,562,796	0
Angelo Gordon Credit Solutions Fund, LP	106,739,697	4,325,340
SMRS-HVDL LLC	101,568,196	96,200,000
Redding Ridge Holdings, LP	96,907,933	17,163,814
Pimco Private Income Fund Onshore Feeder, LLC	96,375,800	0
Harbourvest Direct Lending Fund	92,034,110	30,000,000
AG Essential Housing, LP	89,065,549	58,000,000
Sixth Street Opportunities Partners IV (A), LP	89,014,225	23,031,049
Kayne Anderson BDC, LLC (KABDC)	84,126,953	28,067,547
Irradiant CLO Partners Fund II, LP	66,779,557	20,623,929
HarbourVest Credit Opportunities Fund II, LP	65,160,107	12,000,000
TICP CLO Partners III, LP	63,453,881	24,312,191
Apollo SCRF IV, LP	62,904,454	147,742,521
Monument Park LLC	61,982,252	0
Castle Credit SMRS Holdings, LLC Series C	56,494,420	45,921,187
Blackstone Capital Opportunities Fund IV	46,850,452	105,219,209
Angelo Gordon Credit Solutions Fund II, LP	45,852,523	50,000,000
HPS Mezzanine Partners 2019 LP	44,189,687	10,888,829
Farallon Special Situations Fund II, LP	43,320,512	56,900,397
Fortress MSR Opportunities Fund I A, LP	43,278,613	15,662,214
GSO Capital Opportunities Fund III, LP	39,577,326	29,641,423
Turning Rock Fund I, LP	38,920,586	16,319,293

	Net Market Value	Unfunded Commitment
Sixth Street Specialty Lending Europe II (USD Feeder), LP	36,584,917	84,838,204
Owl Rock Technology Finance Corp II (ORTF II)	36,498,975	163,172,598
HarbourVest Partners Mezzanine Income Fund	36,094,222	16,310,000
Turning Rock Fund II LP	34,630,285	41,764,611
TICP CLO Partners II, LP	28,724,845	1,480,904
Sixth Street Opportunities Partners V (A) LP	25,306,369	97,855,166
Blackstone Capital Opportunities Fund IV Co-Invest	23,930,995	14,094,995
Irradiant Solutions Fund II, LP	23,698,607	225,997,619
Pimco Aviation Co-Invest Vehicle Onshore Feeder LP	14,082,370	90,000,000
GSO COF III Co-Investment Fund, LP	13,952,910	13,774,328
Cerberus SMRS Partners, LP	12,302,049	23,304,657
Marathon CLO Equity Fund, LP	12,031,334	0
EnTrust White Pine Partners, LP	9,009,459	0
PGIM FI Global Liquidity Relative Value Fund I, LP	3,045,827	0
Owl Rock Technology Holdings II (ORTH II)	651,667	24,348,333
TCW/Crescent Mezzanine Partners V, LP	627,819	12,395,466
OCM Opportunities Fund VII, LP	585,667	0
MP Securitized Credit Fund, LP	546,871	0
Oaktree Opportunities Fund VIII, LP	313,390	0
TCW/Crescent Mezzanine Partners VC Secondary	301,551	0
HPS - Specialty Loan Fund III, LP	191,253	5,638,845
OCM Opportunities Fund VIIb, LP	16,847	2,500,000
* Visium Balanced Fund, LP	2	0
SJC Direct Lending Fund II, LP	\$ 0	38,261,315
Total Absolute Return Strategies	9,314,647,087	3,005,647,779
Short-Term Investments & Other	24,552,730	\$ 0
Grand Total	9,339,199,817	3,005,647,779

* Fund of Funds

State of Michigan Retirement System

FIXED INCOME REVIEW

State of Michigan Investment Board Meeting
March 23, 2023



Daniel J. Quigley
Senior Investment Manager
Fixed Income Division

EXECUTIVE SUMMARY

Performance

MPSERS Plan (12/31/22)	1-Year	3-Years	5-Years	7-Years	10-Years
Annualized Returns	-10.9%	-1.4%	1.2%	2.5%	2.4%
Bloomberg Barclays US Agg	-13.0%	-2.7%	0.0%	0.9%	1.1%
Peer Median Returns	-12.7%	-1.8%	0.6%	1.6%	1.5%

- The fixed income portfolio outperformed its benchmark and peer group across all time periods. Recent outperformance was driven by maintaining a shorter interest rate duration than the benchmark during a rising rate environment. The portfolio also benefitted from an overweight to structured fixed income and high yield bonds as coupon income helped to offset interest rate related losses.
- The U.S. Aggregate Bond Index experienced its worse calendar year performance in history with a return of -13.0%. All sectors of the core fixed income index also experienced negative performance during the year. Investment Grade Corporate bonds were the worst performing component of the index with a one-year return of -15.8%, driven by rate increases and credit spread widening. U.S. Treasuries and RMBS also had negative performance, returning -12.5% and -11.8% respectively for the year.
- The Structured Fixed Income sleeve was the main contributor to the portfolio's outperformance. This was mainly due to the floating rate exposure in this portfolio as well as the strong fundamental performance of mortgage credit. The Structured Fixed Income Credit sleeve returned -6.3% for the year, outperforming the index by over 650 basis points (bp).
- The portfolio's allocation to High Yield (HY) credit also helped performance. This portion of the portfolio had a performance of -9.2%, outperforming the index by 380 bp on a relative basis.

Strategy Update

- The objective of the Fixed Income Division portfolio is to meet or exceed the returns of the Bloomberg U.S. Aggregate Bond Index while satisfying the overall characteristics of a core fixed income portfolio. These characteristics are income, liquidity, principal preservation, and diversification from equity market risk. The portfolio has a higher yield than the benchmark while having a risk profile that is similar to the long-term volatility experienced in traditional core fixed income. The yield-to-maturity of the portfolio is currently 6.8% versus a benchmark yield of 4.7%. In addition to this, the

portfolio exhibits risk characteristics that are in line with the historical volatility of traditional fixed income benchmarks and has an equity beta of 0.1.

- The Core-plus strategy implemented to achieve this goal includes:
 - Core: As of December 31, 2022, the portfolio's allocation to U.S. Treasuries, Investment Grade corporate bonds, government-guaranteed U.S. Agency Debentures, RMBS, and Commercial Mortgage-Backed Securities (CMBS) was 71.1%. This includes a 26.3% allocation to U.S. Treasuries, TIPS, and cash.
 - Plus: The portfolio maintains a strategic out-of-benchmark allocation to HY corporate debt, securitized credit, and global fixed income strategies as market opportunities allow. This allocation increases the portfolio yield and total return potential but results in lower liquidity and higher volatility. As of December 31, 2022, the allocation to the Plus portfolio was 28.9%.

Tactical Update

- The allocation to securitized credit, primarily in CMBS, ABS, non-agency RMBS, and CLO securities, was 21.9% of the portfolio at the end of the quarter. The combination of low interest rate duration and high coupon income (often floating rate) offers attractive characteristics for the overall fixed income portfolio in this low interest rate environment. The one-year return on this portfolio was -6.4%.
- The allocation to HY strategies was 4.2% at the end of the quarter. This out-of-benchmark position has outperformed since it has been added to the portfolio. Recent outperformance has been driven by the shorter duration of this portfolio versus the benchmark as well as the higher coupon income in a rising rate environment. The one-year performance of this allocation was -9.2%, outperforming the core index by roughly 380 bp.
- The portfolio has a meaningful allocation to floating rate securities, including AAA CLO investments and investment-grade floating rate corporate bonds. This allocation accounts for approximately 17% of portfolio assets. This allocation will underperform during risk-off markets when interest rates decline, however, it should exhibit strong risk-adjusted return characteristics on a go forward basis in this low interest rate environment.

Market Environment and Outlook

- The yield curve for U.S. Treasury securities remained inverted. The spread between 2-year and 10-year U.S. Treasury Notes decreased by 133 bp during the year, ending at -55 bp. The spread between 3-month and 10-year Treasuries also ended the year negative at -59 bp. This inversion is a reliable predictor of future recessions. This inversion has been driven primarily by a 425 bp increase in the Fed Funds rate for the year as the Federal Reserve has started an aggressive tightening cycle to fight inflation pressures.
- Inflation expectations increased during the quarter with ten-year breakeven inflation ending the quarter at 2.30%. These expectations have declined by 30bp for the year.
- Credit markets recovered during the quarter after underperforming earlier in the year as investment grade (IG) and HY spreads tightened. IG spreads declined by 29 bp for the quarter, ending the calendar year at 130 bp. HY spreads ended the quarter at 469 bp, 83 bp lower than their September level. Both IG and HY spreads remain above their five-year averages.
- Emerging Markets (EM) credit spreads ended the quarter at 339 bp after narrowing by 66 bp over the past three months.

Conclusion

- The portfolio currently has a slight underweight to interest rate duration versus the benchmark and remains overweight to corporate and structured debt securities. This positioning increases the income of the portfolio while also increasing the potential for price volatility. The portfolio will continue to look for attractive risk-adjusted opportunities within the fixed income opportunity set.

SMRS

Fixed Income Holdings

Portfolio Characteristics

Benchmark: Barclays Aggregate

12/31/22

Characteristic	Portfolio	Benchmark
Average Maturity (Yrs)	9.4	8.4
Duration (Yrs)	5.8	6.1
Spread Duration (Yrs)	6.5	6.1
Coupon (%)	3.7	2.7
Yield to Maturity (%)	6.8	4.7
Credit Rating	A+	AA
VaR (%)	9.9	10.5
Tracking Error (%)	1.2	NA
Beta (vs S&P 500)	0.10	0.10

Commentary

Objectives

Income:

Liquidity:

Principal Preservation:

Diversification:

Highlights

The coupon of the portfolio is approximately 100 bps higher than the benchmark. Interest rate movement has been the main driver of U.S. bond market returns for the year, but Income is the primary driver of long-term performance.

26.3% of the portfolio is invested in cash, U.S. Treasuries, and TIPS. These investments can be liquidated via same-day trading.

The portfolio has a large allocation to U.S. Treasuries and carries an investment-grade credit rating.

The equity beta of the portfolio is roughly 0.1 meaning that the portfolio returns have a low correlation with equity market movements.

SMRS

Fixed Income Strategy

12/31/22

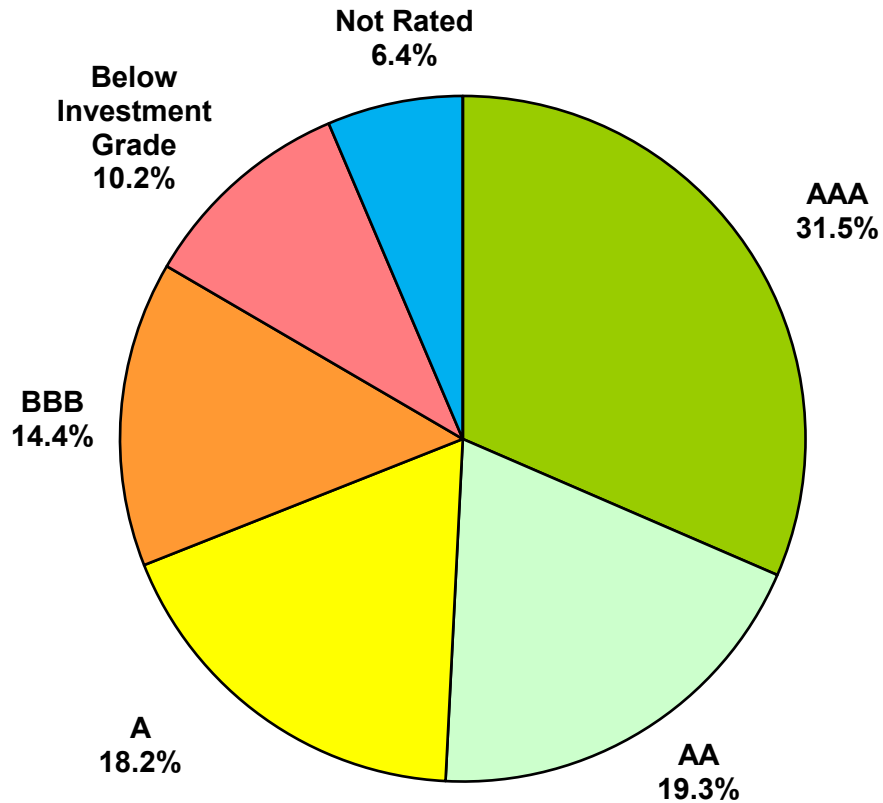
	Amount	Total	% of Total
Core (\$ in Millions)			
FID Internal	\$4,122		
PIMCO Mortgage Fund	519		
TCW Core Plus	385		
PGIM Investment Grade Credit	196		
Total Core		\$5,222	61.2%
Tactical			
Fidelity Tactical	\$475		
Guggenheim Core Plus	375		
Total Tactical		\$850	10.0%
Securitized Debt			
TICP CLO Debt	\$711		
Met West Securitized Ops	624		
Principal CMBS	482		
Napier Park ABS Income	33		
Napier Park Strategic Loan	20		
Total Securitized Debt		\$1,869	21.9%
High Yield			
PGIM High Yield	\$326		
Crescent Direct Lending	32		
Total High Yield		\$358	4.2%
Global			
T. Rowe Global Multi-Sector	\$235		
Total Global		\$235	2.8%
TOTAL		<u>\$8,534</u>	<u>100.0%</u>

NOTE: Totals may not be exact due to rounding.

SMRS

Fixed Income By Rating

12/31/22



Market Value in Millions				
12/31/22				
	Assets	Percent	Benchmark	Difference
AAA	\$2,686	31.5%	71.6%	-40.1%
AA	1,644	19.3%	2.3%	17.0%
A	1,556	18.2%	10.9%	7.3%
BBB	1,226	14.4%	12.1%	2.3%
* Below Investment Grade	874	10.2%	0.3%	9.9%
Not Rated	548	6.4%	2.8%	3.6%
Total Investments	\$8,534	100.0%	100.0%	

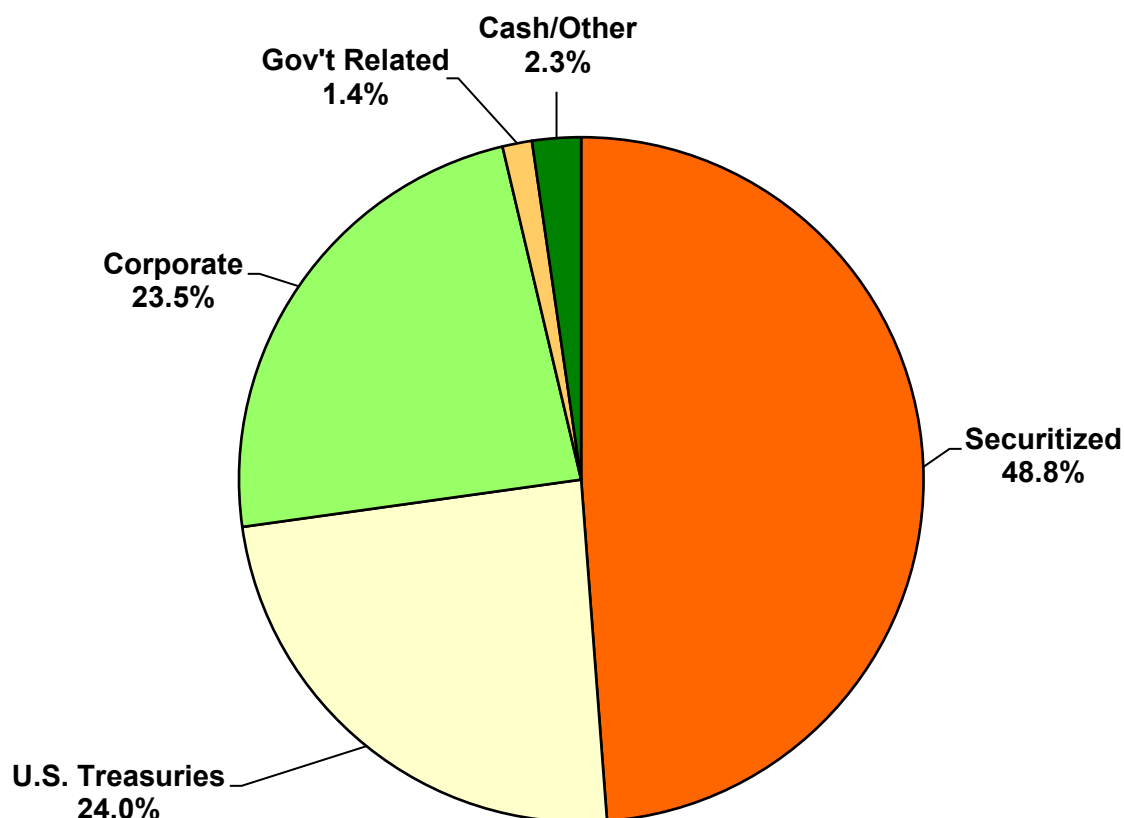
* Comprised of approximately 5.0% High Yield Credit and 5.2% High Yield RMBS/ABS

Benchmark: Barclays US Aggregate

SMRS

Fixed Income By Asset Type

12/31/22



Market Value in Millions				
12/31/22				
	Assets	Percent	Benchmark	Difference
Securitized	\$4,161	48.8%	29.9%	18.9%
U.S. Treasuries	2,046	24.0%	40.8%	-16.8%
Corporate	2,007	23.5%	24.0%	-0.5%
Government Related	123	1.4%	5.3%	-3.9%
Cash/Other	197	2.3%	0.0%	2.3%
Total Investments	\$8,534	100.0%	100.0%	

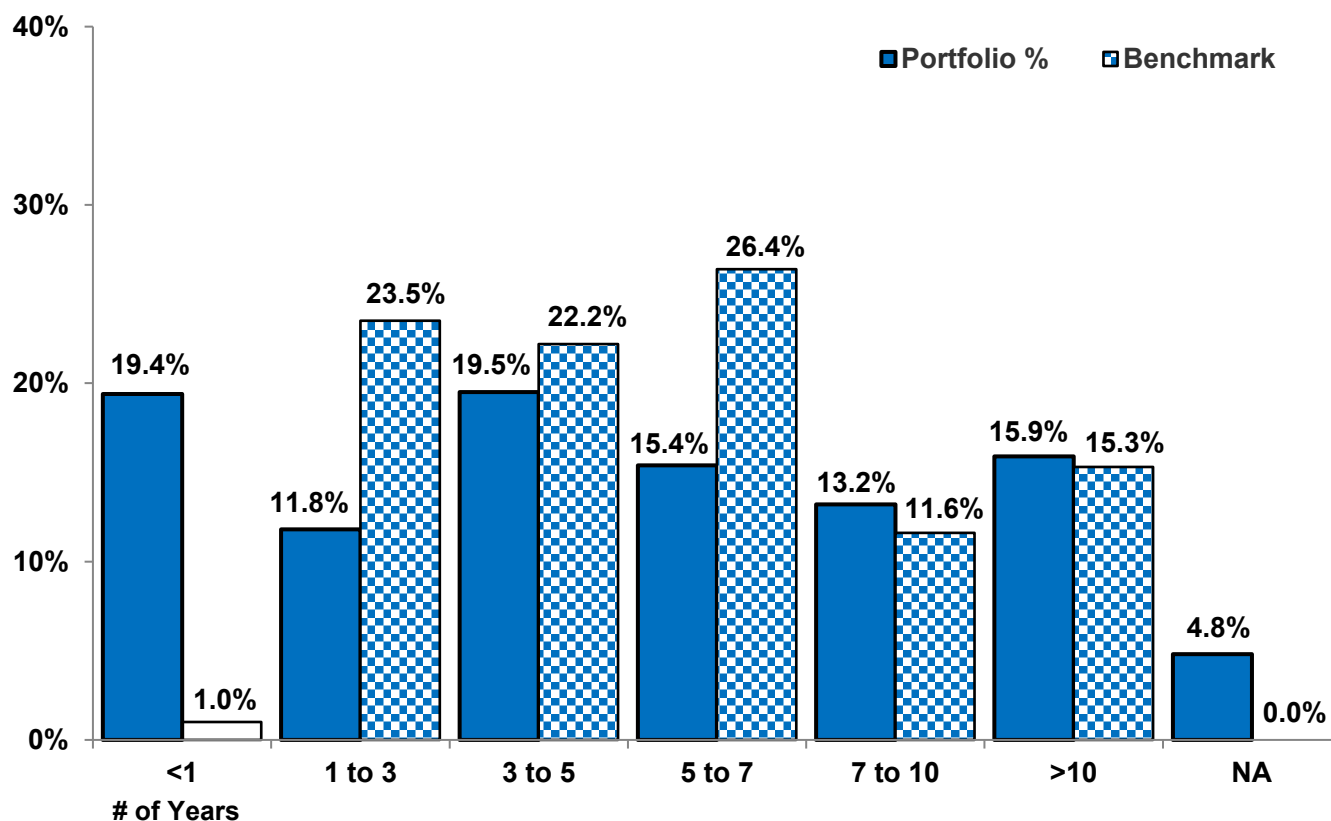
Benchmark: Barclays US Aggregate

SMRS

Duration Distribution

Fixed Income Composite Versus Benchmark

12/31/22



Source: Factset

Market Value in Millions					
Duration	Assets	Portfolio Weight	Benchmark Weight	Portfolio Duration*	Benchmark Duration*
<1	\$1,660	19.4%	1.0%	-0.1	0.9
1 to 3	1,004	11.8%	23.5%	2.0	1.9
3 to 5	1,665	19.5%	22.2%	4.0	4.1
5 to 7	1,316	15.4%	26.4%	6.1	6.0
7 to 10	1,123	13.2%	11.6%	7.8	7.6
>10	1,360	15.9%	15.3%	16.7	15.0
NA	406	4.8%	0.0%	NA	NA
Total	\$8,534	100.0%	100.0%	5.8	6.1

* Effective Duration

Benchmark: Barclays US Aggregate

Fixed Income Performance - Net of Fees (MPERS) 12/31/22

	<u>Market Value</u>	<u>1-Yr</u>	<u>3-Yrs</u>	<u>5-Yrs</u>	<u>7-Yrs</u>	<u>10-Yrs</u>
Total Fixed Income	\$8,534,430,176	-11.03%	-1.63%	1.01%	2.24%	2.19%
<i>Bloomberg Aggregate Bond Index</i>	<i>N/A</i>	<i>-13.01%</i>	<i>-2.71%</i>	<i>0.02%</i>	<i>0.89%</i>	<i>1.06%</i>
Internal Core Fixed Income	\$4,121,904,547	-12.67%	-2.18%	0.68%	1.72%	1.86%
Externally Managed Fixed Income	\$4,412,525,628	-9.18%	-1.09%	1.31%	2.91%	2.51%
External Core Fixed Income	519,039,309	-12.37%	-3.35%	-0.54%	0.96%	1.05%
PIMCO Mortgage Fund	519,039,309	-12.37%	-3.35%	-0.56%		
<i>Bloomberg US MBS Agy Fixed Indx</i>	<i>N/A</i>	<i>-11.81%</i>	<i>-3.22%</i>	<i>-0.53%</i>		
Investment Grade Credit	\$195,735,242	-16.03%	-2.42%	0.72%	2.41%	2.24%
PGIM Investment Grade	195,735,242	-16.03%	-2.42%	0.72%	2.41%	2.30%
<i>Bloomberg Credit Index</i>	<i>N/A</i>	<i>-15.26%</i>	<i>-2.86%</i>	<i>0.42%</i>	<i>1.96%</i>	<i>1.82%</i>
Tactical Fixed Income	\$1,235,476,861	-11.38%	-0.69%	1.71%	2.80%	3.50%
Fidelity Tactical Bond Fund	475,020,377	-10.90%	-0.51%	2.04%	3.73%	
Guggenheim Core Plus	375,209,707	NA				
TCW Core Plus	385,246,777	NA				
<i>Bloomberg Aggregate Bond Index</i>	<i>N/A</i>	<i>-13.01%</i>	<i>-2.71%</i>	<i>0.02%</i>	<i>0.89%</i>	<i>1.06%</i>
High Yield Fixed Income	\$358,048,228	-9.20%	1.02%	3.20%	4.99%	
PGIM High Yield	325,815,732	-10.90%	0.97%	3.37%	5.28%	
Crescent Direct Lending	32,232,496	7.61%	7.48%			
<i>Bloomberg US HY BA/B 1% Cap</i>	<i>N/A</i>	<i>-10.43%</i>	<i>0.08%</i>	<i>2.49%</i>	<i>4.72%</i>	
Structured Fixed Income	\$1,868,763,442	-6.35%	-0.59%	1.59%		
TICP CLO Debt	711,018,269	-2.55%	3.80%	3.53%		
Opportunities	623,814,251	-6.49%	-0.02%	1.54%	2.70%	
Principal CMBS	481,808,878	-13.10%	-2.51%	0.88%	2.01%	3.33%
Napier Park ABS Income	32,553,010	-1.82%	9.08%	8.94%	9.70%	
Napier Park Strategic Loan LP	19,569,034	9.12%	3.79%	5.07%		
<i>Bloomberg Aggregate Bond Index</i>	<i>N/A</i>	<i>-13.01%</i>	<i>-2.71%</i>	<i>0.02%</i>	<i>0.89%</i>	<i>1.06%</i>
<i>Blended CMBS Benchmark</i>	<i>N/A</i>	<i>-10.94%</i>	<i>-1.70%</i>	<i>0.76%</i>	<i>1.77%</i>	<i>1.77%</i>
Global Fixed Income	\$235,462,546	-13.22%	-2.25%	0.24%		
T. Rowe Global Multi-Sector	235,462,546	-13.22%	-2.16%	0.58%		
<i>Custom GMS Benchmark</i>	<i>N/A</i>	<i>-10.68%</i>	<i>-2.35%</i>	<i>0.71%</i>		

State of Michigan Retirement System

DOMESTIC EQUITY REVIEW

State of Michigan Investment Board Meeting
March 23, 2023



Jack A. Behar, CFA
Senior Investment Manager
Domestic Equity Division

EXECUTIVE SUMMARY

Performance

MPSERS Plan (12/31/22)	1-Year	3-Years	5-Years	7-Years	10-Years
Annualized Returns	-22.5%	4.4%	7.6%	10.2%	11.6%
S&P 1500	-17.8%	7.6%	9.2%	11.3%	12.4%
Peer Median Return	-15.9%	5.5%	6.6%	8.9%	9.6%

*State Street Universe greater than \$1 billion

- For the year ended December 31, 2022, the Domestic Equity Division (DED) underperformed its peer group and the S&P 1500 by 660 basis points (bps) and 470 bps respectively, with incurred tracking error of 1.6%. DED performed near the top quartile of peers over the past seven and ten years, in the top half over five years, and below the S&P 1500 over all periods.
- Energy, defensive and value stocks did well over the past year, while growth companies, where DED was overweight, underperformed. Additionally, the Disruptive Innovation space, which experienced disproportionate buying just a few years prior, continued to weather inversely disproportionate selling in 2022. We continue to believe our Disruptive Innovation portfolios are significantly underpriced, with excellent long-term return potential. Our managers have excelled in this space for over 30 years and know how to successfully navigate cycles like these.
- In hindsight, DED erred in 2020 by reducing value exposure and adding expensive momentum exposure to the portfolio in an effort to balance out its long-time value orientation during a period where value stocks were struggling. Since then, value has gone on to significantly outperform, while momentum stocks have suffered meaningful underperformance.
- This decision resulted in a growth stock overweight, which hurt performance in late 2021 and 2022, as growth went from being richly priced and in favor, to highly underpriced and out of favor. Rather than being reactive, DED has taken advantage of the current environment to maintain its exposure to growth and add leading, high-quality companies to the portfolio at price levels that haven't been seen in over a decade. While in the short term this has compounded underperformance, we believe this portfolio will grow quickly and meaningfully outperform the market once the Fed has concluded its rate rising cycle and the economy recovers from its induced slowdown.
- A handful of value managers in the portfolio performed exceptionally well in the year ended December of 2022: Michigan based managers, Clarkston Capital and Seizert Capital outperformed the market by nearly 20% and 10% respectively, while Attucks Asset Management, one of DED's emerging manager of managers, beat the S&P 1500 by over 15%.

Asset Class Goal

To provide the SMRS with long-term domestic equity market returns or better, by investing in a diversified and attractively valued portfolio of companies at an index fund-like cost.

Strategy Update

- The Domestic Equity Division's portfolio remains undervalued when measured against ours and outside analysts' estimates of fair value, trading at nearly a 7% discount to the S&P 1500 on this year's earnings and an even further discount to normalized earnings.
- The correction we saw in stocks, bonds and housing in 2022 was both healthy and supportive of the Fed's goal of reducing excess inflationary demand in the economy. Significant declines in money supply measures since the beginning of the Fed's tightening cycle also portend a more balanced inflationary environment in the second half of 2023.
- While it's possible that the Fed's aggressive tightening campaign could send the economy into recession in 2023, we believe stock prices will be materially higher than current levels looking forward over the next few years.
- DED is overweight communication services and financials, highlighting the significant expected return opportunity that has presented itself in these sectors as the market has corrected in 2022. Portfolio underweights include consumer discretionary and industrials.

Market Environment and Outlook

- At ~16.4x forward earnings, equity markets trade at an earnings yield (earnings/price) of nearly 6.1%, or ~220 bps higher than 10-year treasury bonds at ~3.9%, or ~26x earnings.
- Historically, stocks have traded at an earnings yield approximately 125 bps higher than bonds versus today's spread of 220 bps, suggesting that stocks could meaningfully appreciate over the long-term, even with bond yields remaining at these levels.
- Similarly, while in the short-term higher bond yields driven by Fed tightening could cause further downside market volatility, the Fed has room to raise rates without significantly depressing stock valuations over the long-term. Moreover, long-term bond yields have been on a downward trajectory so far in 2023, suggesting that the bond market believes the Fed will be successful in taming inflation. This is positive for equities longer term.
- Over time we expect the market to return roughly 9.6%, driven by a dividend yield of 1.7% and dividend per share growth of 7.9%.
 - Dividend per share growth driven by nominal economic growth of 5% and further 2.9% growth driven by share buybacks from cash flow rich companies.

SMRS

Domestic Equity Strategies

12/31/22

Markets	Amount	Total	% of Total
Internal Indexed (\$ in Millions)			
Indexed Portfolios	\$9,994		
Total Indexed		\$9,994	58.1%
Internal Active			
Active Portfolios	\$4,587		
Total Internal Active		\$4,587	26.7%
External Active			
Los Angeles Capital	\$582		
Clarkston Capital Partners	448		
Seizert Capital Partners	436		
Martin Currie US LT Unconstrained	412		
ARK Investments	180		
Attucks Asset Management	133		
Patient Capital	123		
Bivium Capital	115		
Managed Asset Portfolios	95		
Ancora	95		
Total External Active		\$2,619	15.2%

Total Domestic Equity

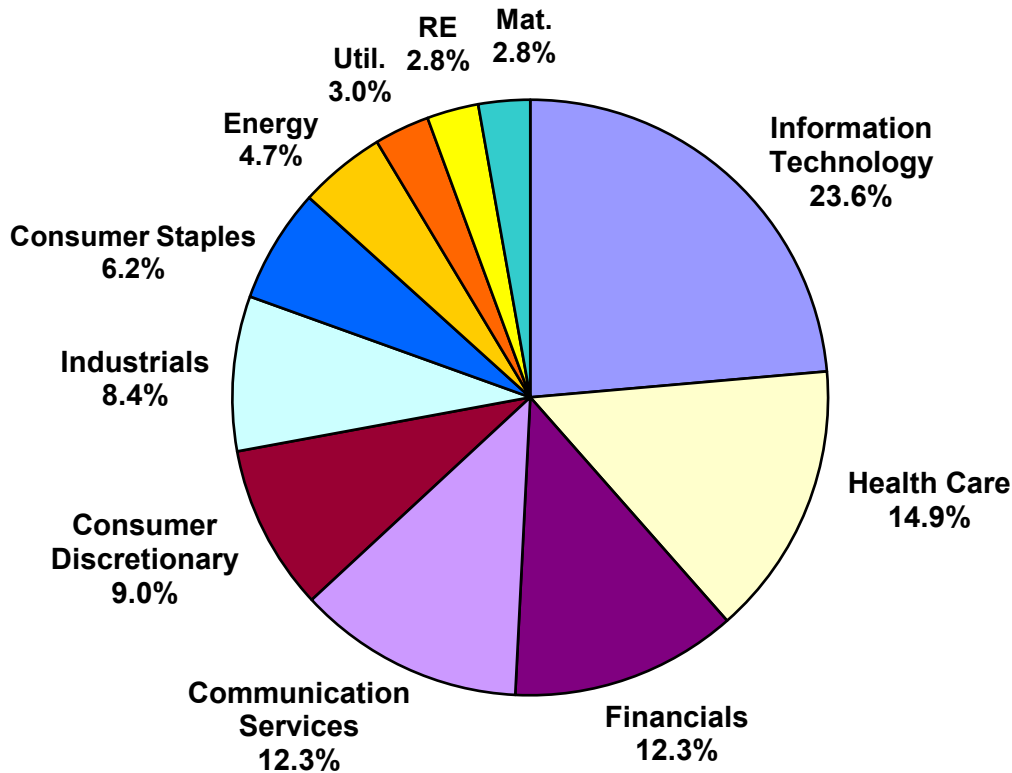
\$17,200

100.0%

SMRS

Domestic Equity By Sector

12/31/22



Market Value in Millions				
12/31/22				
	Assets	Percent	Benchmark	Difference
Information Technology	\$4,062	23.6%	24.6%	-1.0%
Health Care	2,561	14.9%	15.4%	-0.5%
Financials	2,114	12.3%	12.0%	0.3%
Communication Services	2,111	12.3%	6.8%	5.5%
Consumer Discretionary	1,553	9.0%	10.1%	-1.1%
Industrials	1,452	8.4%	9.5%	-1.1%
Consumer Staples	1,068	6.2%	7.0%	-0.8%
Energy	809	4.7%	5.2%	-0.5%
Utilities	511	3.0%	3.2%	-0.2%
Real Estate	480	2.8%	3.2%	-0.4%
Materials	479	2.8%	3.0%	-0.2%
Total	\$17,200	100.0%	100.0%	

Benchmark: S&P 1500

SMRS

Domestic Equities Composite

12/31/22

Date:	<u>12/31/22</u>	<u>9/30/22</u>	<u>6/30/22</u>	<u>3/31/22</u>
Assets (\$ in Millions):	\$17,200	\$16,271	\$17,652	\$22,354
Number of Securities:	1,664	1,785	1,856	3,023
Active Share:	24%	25%	28%	37%

Description: The Domestic Equities Composite seeks to deliver excess returns through a blend of index investing and active management with value-added, but diverse strategies. While the goal is for most managers to outperform in the long run, the composite is designed such that they do so during differing parts of the business cycle.

	SMRS	S&P 1500
Characteristics:		
Market Cap. (\$ in Billions)	\$376.4	\$383.1
FY1 P/E	15.3	16.4
P/E upside to S&P 1500	6.6%	0.0
Return on Equity	22.6%	20.2%
Risk Metrics		
Beta	1.10	1.00
Tracking Error	2.8%	0.0%
Projected Returns		
Dividend Yield	2.2%	1.7%
Buyback Yield	2.7%	2.9%
Reinvestment Rate	<u>5.6%</u>	<u>5.0%</u>
Projected Investment Return	10.5%	9.6%

TOP TEN EXPOSURES – Domestic Equities vs S&P 1500 12/31/22

<u>Domestic Equity Portfolio</u>		<u>S&P 1500</u>	
<u>Company Name</u>	<u>Portfolio Weight</u>	<u>Company Name</u>	<u>Market Weight</u>
Apple, Inc.	4.9%	Apple, Inc.	5.5%
Microsoft Corporation	4.5%	Microsoft Corporation	5.1%
U.S. Dollar	3.7%	Amazon.com, Inc.	2.1%
Meta Platforms, Inc., Class A	2.5%	Berkshire Hathaway Inc., Class B	1.6%
AT&T, Inc.	2.3%	Alphabet Inc., Class A	1.5%
Verizon Communications, Inc.	2.3%	UnitedHealth Group, Inc.	1.4%
Alphabet Inc., Class A	2.0%	Alphabet Inc., Class C	1.3%
Amazon.com, Inc.	1.8%	Johnson & Johnson	1.3%
UnitedHealth Group, Inc.	1.6%	Exxon Mobil Corporation	1.3%
Apollo Global Management, Inc.	<u>1.3%</u>	JPMorgan Chase & Co.	<u>1.1%</u>
TOTAL	<u>26.9%</u>	TOTAL	<u>22.2%</u>

Domestic Equity Performance - Net of Fees

12/31/22

<u>Fund Name</u>	<u>Market Value</u>		<u>5-Yrs</u>	<u>7-Yrs</u>	<u>Incept.</u>	<u>Incept. Date</u>
SMRS S&P 500 Index	\$9,387,486,373	-18.1%	7.6%	9.4%	11.5%	--
S&P 500		-18.1%	7.7%	9.4%	11.5%	--
Style & Risk Adj Benchmark		-18.1%	7.7%	9.4%	11.5%	--
Lipper Lg-Cap Core		-18.1%	7.2%	8.9%	10.7%	--
<i>Excess Return</i>		<i>0.0%</i>	<i>0.0%</i>	<i>0.0%</i>	<i>0.0%</i>	<i>--</i>
<i>Alpha</i>		<i>-0.1%</i>	<i>0.0%</i>	<i>0.0%</i>	<i>0.0%</i>	<i>--</i>
<i>Pct. Rank vs Lipper LI-Cap Core</i>		<i>47</i>	<i>36</i>	<i>39</i>	<i>26</i>	<i>--</i>
SMRS Large-Cap Core	1,253,855,351	-24.2%	4.1%	8.3%	10.3%	8.2%
S&P 500		-18.1%	7.7%	9.4%	11.5%	8.7%
Style & Risk Adj Benchmark		-6.9%	9.1%	10.0%	13.3%	7.8%
Lipper Large-Cap Core		-18.1%	7.2%	8.9%	10.7%	8.2%
<i>Excess Return</i>		<i>-6.0%</i>	<i>-3.5%</i>	<i>-1.2%</i>	<i>-1.2%</i>	<i>-0.5%</i>
<i>Alpha</i>		<i>-17.3%</i>	<i>-5.0%</i>	<i>-1.8%</i>	<i>-3.0%</i>	<i>0.4%</i>
<i>Pct Rank vs Lipper Lg-Cap Core</i>		<i>96</i>	<i>98</i>	<i>72</i>	<i>72</i>	<i>55</i>
SMRS All-Cap Garp	1,125,635,376	-30.2%	-2.1%	1.9%	5.5%	9.1%
S&P 1500 Super Composite		-17.8%	7.6%	9.2%	11.3%	11.5%
Style & Risk Adj Benchmark		-22.1%	8.0%	9.8%	12.0%	12.0%
Lipper Multi-Cap Core		-17.5%	6.1%	7.3%	9.5%	9.5%
<i>Excess Return</i>		<i>-12.4%</i>	<i>-9.6%</i>	<i>-7.2%</i>	<i>-5.9%</i>	<i>-2.4%</i>
<i>Alpha</i>		<i>-8.1%</i>	<i>-10.0%</i>	<i>-7.9%</i>	<i>-6.5%</i>	<i>-2.9%</i>
<i>Pct. Rank vs Lipper Multi-Cap Core</i>		<i>98</i>	<i>99</i>	<i>95</i>	<i>94</i>	<i>65</i>
Value, Quality, Momentum Composite	777,377,221	-17.4%	--	--	--	6.7%
S&P 1500		-17.8%	--	--	--	8.3%
Style & Risk Adj Benchmark		-17.8%	--	--	--	8.3%
Lipper Multi-Cap Core		-17.5%	--	--	--	7.1%
<i>Excess Return</i>		<i>0.4%</i>	<i>--</i>	<i>--</i>	<i>--</i>	<i>-1.5%</i>
<i>Alpha</i>		<i>0.4%</i>	<i>--</i>	<i>--</i>	<i>--</i>	<i>-1.5%</i>
<i>Pct. Rank vs Lipper Multi-Cap Core</i>		<i>45</i>	<i>--</i>	<i>--</i>	<i>--</i>	<i>60</i>
SMRS Large-Cap Growth	627,367,636	-28.0%	8.0%	11.4%	11.4%	10.1%
S&P 500 Growth		-29.4%	7.5%	10.3%	12.1%	10.2%
Style & Risk Adj Benchmark		-25.1%	6.9%	9.8%	11.6%	10.0%
Lipper Large-Cap Growth		-30.9%	5.1%	8.9%	10.6%	9.4%
<i>Excess Return</i>		<i>1.4%</i>	<i>0.4%</i>	<i>1.1%</i>	<i>-0.7%</i>	<i>-0.1%</i>
<i>Alpha</i>		<i>-2.9%</i>	<i>1.1%</i>	<i>1.6%</i>	<i>-0.2%</i>	<i>0.1%</i>
<i>Pct Rank vs Lipper Lg-Cap Growth</i>		<i>27</i>	<i>12</i>	<i>10</i>	<i>33</i>	<i>29</i>

<u>Fund Name</u>	<u>Market Value</u>		<u>5-Yrs</u>	<u>7-Yrs</u>	<u>Incept.</u>	<u>Incept. Date</u>	
SMRS Mid-Cap Index	606,100,107	-13.0%	7.2%	6.8%	10.2%	--	N/A
S&P 400		-13.1%	7.2%	6.7%	9.9%	--	
Style & Risk Adj Benchmark		-13.0%	7.2%	6.7%	9.9%	--	
Lipper Mid-Cap Core		-13.0%	6.2%	6.2%	8.9%	--	
<i>Excess Return</i>		<i>0.1%</i>	<i>0.0%</i>	<i>0.0%</i>	<i>0.3%</i>	<i>--</i>	
<i>Alpha</i>		<i>0.0%</i>	<i>0.0%</i>	<i>0.1%</i>	<i>0.3%</i>	<i>--</i>	
<i>Pct. Rank vs Lipper Mid-Cap Core</i>		<i>52</i>	<i>34</i>	<i>42</i>	<i>18</i>	<i>--</i>	
LA Capital All-Cap Growth	581,803,088	-25.4%	5.5%	8.5%	10.7%	11.0%	5/31/05
S&P 1500 Growth		-28.7%	7.4%	9.9%	11.8%	10.1%	
Style & Risk Adj Benchmark		-26.9%	7.0%	9.2%	10.9%	10.3%	
Lipper Multi-Cap Growth		-32.9%	3.7%	7.6%	9.6%	8.9%	
<i>Excess Return</i>		<i>3.2%</i>	<i>-1.9%</i>	<i>-1.4%</i>	<i>-1.2%</i>	<i>0.9%</i>	
<i>Alpha</i>		<i>1.5%</i>	<i>-1.5%</i>	<i>-0.7%</i>	<i>-0.2%</i>	<i>0.8%</i>	
<i>Pct. Rank vs Lipper Multi-Cap Growth</i>		<i>20</i>	<i>42</i>	<i>39</i>	<i>36</i>	<i>5</i>	
Large-Cap Consistent Growth	458,957,531	-36.9%	0.2%	7.1%	9.1%	8.7%	3/1/15
S&P 500		-18.1%	7.7%	9.4%	11.5%	10.0%	
Style & Risk Adj Benchmark		-31.5%	8.1%	10.5%	12.4%	11.1%	
Lipper Large-Cap Core		-18.1%	7.2%	8.9%	10.7%	9.2%	
<i>Excess Return</i>		<i>-18.8%</i>	<i>-7.5%</i>	<i>-2.3%</i>	<i>-2.4%</i>	<i>-1.3%</i>	
<i>Alpha</i>		<i>-5.4%</i>	<i>-7.9%</i>	<i>-3.4%</i>	<i>-3.4%</i>	<i>-2.4%</i>	
<i>Pct. Rank vs Lipper Lg-Cap Core</i>		<i>100</i>	<i>100</i>	<i>88</i>	<i>90</i>	<i>73</i>	
Clarkston Capital Small/Mid-Cap	447,481,842	-2.5%	8.4%	8.4%	10.3%	10.5%	1/1/14
S&P 400		-14.0%	6.8%	6.5%	9.9%	8.3%	
Style & Risk Adj Benchmark		-14.5%	6.1%	6.7%	9.0%	6.7%	
Lipper Mid-Cap Core		-13.0%	6.2%	6.2%	8.9%	7.4%	
<i>Excess Return</i>		<i>11.5%</i>	<i>1.6%</i>	<i>1.9%</i>	<i>0.4%</i>	<i>2.2%</i>	
<i>Alpha</i>		<i>2.9%</i>	<i>2.9%</i>	<i>2.2%</i>	<i>1.6%</i>	<i>3.9%</i>	
<i>Pct. Rank vs Lipper Mid-Cap Core</i>		<i>1</i>	<i>10</i>	<i>8</i>	<i>8</i>	<i>1</i>	
Seizert Capital Partners	436,094,154	-11.7%	8.8%	8.8%	11.1%	12.4%	11/30/09
S&P 1500 Value		-5.5%	6.4%	7.5%	10.0%	11.4%	
Style & Risk Adj Benchmark		-9.0%	6.4%	7.4%	10.0%	11.4%	
Lipper Multi-Cap Value		-6.8%	6.9%	6.7%	9.1%	10.3%	
<i>Excess Return</i>		<i>-6.2%</i>	<i>2.4%</i>	<i>1.3%</i>	<i>1.1%</i>	<i>1.1%</i>	
<i>Alpha</i>		<i>-2.7%</i>	<i>2.4%</i>	<i>1.3%</i>	<i>1.1%</i>	<i>1.0%</i>	
<i>Pct. Rank vs Lipper Multi-Cap Value</i>		<i>84</i>	<i>20</i>	<i>10</i>	<i>9</i>	<i>4</i>	
Martin Currie	411,932,181	-37.6%	--	--	--	-5.8%	11/1/20
S&P 1500 Growth		-28.7%	--	--	--	3.3%	
Style & Risk Adj Benchmark		-34.5%	--	--	--	3.7%	
Lipper Multi-Cap Growth		-32.9%	--	--	--	-4.6%	
<i>Excess Return</i>		<i>-8.9%</i>	<i>--</i>	<i>--</i>	<i>--</i>	<i>-9.1%</i>	
<i>Alpha</i>		<i>-3.1%</i>	<i>--</i>	<i>--</i>	<i>--</i>	<i>-9.5%</i>	
<i>Pct. Rank vs Lipper Multi-Cap Growth</i>		<i>76</i>	<i>--</i>	<i>--</i>	<i>--</i>	<i>58</i>	

<u>Fund Name</u>	<u>Market Value</u>		<u>5-Yrs</u>	<u>7-Yrs</u>	<u>Incept.</u>	<u>Incept.</u> <u>Date</u>	
Ark Investments	180,075,884	-67.4%	-18.7%	-7.5%	--	4.9%	3/1/16
S&P 1500 Growth		-28.7%	7.4%	9.9%	--	13.1%	
Style & Risk Adj Benchmark		-25.0%	10.0%	14.1%	--	19.2%	
Lipper Multi-Cap Growth		-32.9%	3.7%	7.6%	--	11.3%	
<i>Excess Return</i>		-38.8%	-26.1%	-17.4%	--	-8.2%	
<i>Alpha</i>		-42.4%	-28.7%	-21.6%	--	-14.3%	
<i>Pct. Rank vs Lipper Multi-Cap Growth</i>		100	100	100	--	96	
Attucks Asset Management	132,763,053	-5.2%	5.7%	7.1%	9.1%	6.9%	11/30/07
S&P 1500		-17.8%	7.6%	9.2%	11.3%	8.4%	
Style & Risk Adj Benchmark		-5.9%	6.3%	7.3%	9.8%	8.2%	
Lipper Multi-Cap Core		-17.5%	6.1%	7.3%	9.5%	6.8%	
<i>Excess Return</i>		12.6%	-1.9%	-2.0%	-2.3%	-1.4%	
<i>Alpha</i>		0.7%	-0.7%	-0.2%	-0.7%	-1.3%	
<i>Pct. Rank vs Lipper Multi-Cap Core</i>		3	67	62	66	52	
Patient Capital	123,022,042	-33.9%	--	--	--	-32.2%	10/1/21
S&P 1500 Value		-5.5%	--	--	--	1.8%	
Style & Risk Adjusted Benchmark		-8.2%	--	--	--	0.3%	
Lipper Multi-Cap Value		-6.8%	--	--	--	0.3%	
<i>Excess Return</i>		-28.4%	--	--	--	-34.0%	
<i>Alpha</i>		-25.7%	--	--	--	-32.5%	
<i>Pct. Rank vs Lipper Multi-Cap Value</i>		100	--	--	--	100	
Bivium Capital Partners	115,421,256	-17.2%	1.1%	3.4%	6.9%	5.7%	11/30/07
S&P 1500 Value		-5.5%	6.4%	7.5%	10.0%	6.7%	
Style & Risk Adj Benchmark		-17.4%	7.4%	9.1%	11.4%	8.5%	
Lipper Multi-Cap Value		-6.8%	6.9%	6.7%	9.1%	6.3%	
<i>Excess Return</i>		-11.7%	-5.3%	-4.0%	-3.2%	-1.0%	
<i>Alpha</i>		0.2%	-6.3%	-5.7%	-4.6%	-2.8%	
<i>Pct. Rank vs Lipper Multi-Cap Value</i>		97	98	95	93	71	
Disruptive Innovation Momentum	98,430,606	-60.1%	--	--	--	-26.2%	9/1/20
MSCI Momentum Index		-18.2%	--	--	--	-1.0%	
Style & Risk Adj Benchmark		-33.2%	--	--	--	11.2%	
Lipper Multi-Cap Growth		-32.9%	--	--	--	-6.1%	
<i>Excess Return</i>		-41.9%	--	--	--	-25.2%	
<i>Alpha</i>		-26.9%	--	--	--	-37.4%	
<i>Pct. Rank vs Lipper Multi-Cap Growth</i>		96	--	--	--	95	

<u>Fund Name</u>	<u>Market Value</u>		<u>5-Yrs</u>	<u>7-Yrs</u>	<u>Incept.</u>	<u>Incept.</u> <u>Date</u>	
Managed Asset Portfolios	95,279,728	-10.1%	5.6%	7.3%	--	10.5%	2/29/16
S&P 1500 Value		-5.5%	6.4%	7.5%	--	11.0%	
Style & Risk Adj. Benchmark		-4.7%	5.4%	6.1%	--	9.7%	
Lipper Multi-Cap Value		-6.8%	6.9%	6.7%	--	10.1%	
<i>Excess Return</i>		-4.6%	-0.8%	-0.2%	--	-0.5%	
<i>Alpha</i>		-5.3%	0.2%	1.2%	--	0.7%	
<i>Pct. Rank vs Lipper Multi-Cap Value</i>		80	76	38	--	41	
Ancora	94,995,238	-16.0%	5.0%	5.2%	--	5.7%	10/1/17
S&P 1000		-14.0%	6.8%	6.5%	--	7.2%	
Style & Risk Adj. Benchmark		-6.7%	7.5%	6.5%	--	7.2%	
Lipper Mid-Cap Core		-13.0%	6.2%	6.2%	--	7.0%	
<i>Excess Return</i>		-2.0%	-1.8%	-1.3%	--	-1.6%	
<i>Alpha</i>		-9.3%	-2.6%	-1.3%	--	-1.5%	
<i>Pct. Rank vs Lipper Mid-Cap Core</i>		74	75	72	--	77	
All-Cap Core	8,817,927	--	--	--	--	-12.1%	
S&P 1500		--	--	--	--	-5.7%	
Style & Risk Adj. Benchmark		--	--	--	--	-6.5%	
Lipper Multi-Cap Core		--	--	--	--	-5.1%	
<i>Excess Return</i>		--	--	--	--	-6.4%	
<i>Alpha</i>		--	--	--	--	-5.6%	
<i>Pct. Rank vs Lipper Multi-Cap Core</i>		--	--	--	--	98	

State of Michigan Retirement System

INTERNATIONAL EQUITY REVIEW

State of Michigan Investment Board Meeting

March 23, 2023



Patrick M. Moraniec, CFA
Senior Investment Manager
International Equity Division

EXECUTIVE SUMMARY

Performance

MPSERS Plan (12/31/22)	1-Year	3-Years	5-Years	7-Years	10-Years
Annualized Returns	-19.2%	0.0%	1.1%	5.1%	4.6%
MSCI ACWI ex USA Returns	-16.0%	0.1%	0.9%	4.8%	3.9%
Peer Median Returns	-15.8%	1.0%	1.8%	5.2%	4.8%

*Source: State Street Universe greater than \$1 billion

- The portfolio underperformed the benchmark by 3.2% over the last twelve months.
- The underperformance was driven by the exposure to the quality factor, momentum factor, the information technology sector, and the energy sector.

Asset Class Goals

- Construct a non-U.S. equity-focused portfolio to generate, on a consistent basis, ten-year returns that exceed the MSCI ACWI ex USA by 1.0%.
- Perform in the top half of the public plan peer universe percentile rankings.
- Advance people, processes, and systems to continuously improve investment decisions.

Strategy

- The division allocates capital with the intention of persistent exposure to the quality factor, momentum factor, and value factor.
- Persistent factor exposures create consistent, transparent, low-cost, efficient returns.
- Current portfolio drivers of risk and return.
 - The tracking error of the portfolio is approximately 2.5%, which is below the division's risk budget of 3.0%.
 - The division's core strategy of exposure to the quality, value, and momentum factors (QVM), accounts for collectively 1.9% of the total tracking error, indicating that long-term, the portfolio is not materially exposed to any single risk.
- Quarterly changes to International Equity Division allocation.
 - Raised \$0.5 billion through equity sales in the core strategy as well as Martin Currie to provide additional liquidity for SMRS.
 - Rebalanced \$0.7 billion of equity swaps to match the division's long-term equity factor strategy.

Market Environment and Outlook

Market Environment

- International stock markets were down -16.0% over the last twelve months. Earnings per share (EPS) were flat relative to the May 2022 peak and the forward one-year growth estimates for EPS declined.
- Performance of the quality, value, and momentum factors (QVM) remains strategically important to the IED. Over the last twelve months, the value factor outperformed the MSCI ACWI ex USA by 4.7%. The momentum factor and quality factor continued to lag, underperforming the benchmark -3.4% and -4.4% respectively. IED's core strategy remains balanced and consistent despite the strategy underperforming the division's benchmark by -0.5% in 2022.
- Emerging markets underperformed the MSCI ACWI ex USA by -4.1% over the last year. Developed markets outperformed the broader index by 1.7%.
- The U.S. dollar gained 8.0% in 2022 relative to developed currencies.
- Despite the recent decline in commodities, they remain up 13.8% in 2022. Oil gained 6.7% year-over-year, gold was flat, and copper declined -14.6%.
- Global government interest rates (index weighted) remain low by historical standards but are significantly higher at 3.9% as of year-end.

Outlook

- Global stocks, commodities, and real estate have risen at a pace that indicates significant global inflation across asset classes.
- Major central banks continue to remove liquidity from the financial system. The impact of this withdrawal will act as a headwind for further gains across all asset classes.
- The global economy is slowing and may contract in 2023. International stock markets' earnings per share grew at 2.4% year-over-year. The growth rate in earnings has been steadily declining since the peak of 35.5% set in May 2022 for this cycle.
- Europe's sales and earnings per share expanded year-over-year by 9.7% and 11.8%. Forward-looking sales per share are expected to be up over the next 12 months, 1.1% and earnings are expected to decline by -0.2%.
- Japan's sales and earnings per share increased year-over-year by 1.8% and 3.0% respectively. Forward-looking sales and earnings per share growth are expected to rise 2.8% and 4.5% respectively for the full year 2023.
- Energy costs have soared even before the war in Ukraine. The same dynamic has occurred across other major input commodities such as soybeans, wheat, and corn. Price increases have begun to moderate in both consumers' and producers' expectations but remain well above central banks' inflation targets.

- Major central banks, apart from the Bank of Japan, have changed monetary policies from accommodative to tightening in 2022 to rein in inflation. Currently, the market continues to believe that central banks will win the fight against inflation. If that belief proves incorrect, interest rates will remain structurally higher for longer than the markets are pricing in. This will impact the discount rates in corporate boardrooms and may have a chilling effect on global GDP.
- Persistently high inflation may force the banks to taper more quickly, leading markets to reassess how much support central banks will provide to indebted governments. Significantly higher interest rates may potentially lead to a further contraction in equity market multiples.
- If the major central banks stop tightening, their respective currencies will come under significant pressure, similar to what has occurred in Japan this year. Temporarily this may cause inflation to flatline well above the 2.0% target creating a more hawkish interest rate environment towards the end of 2023.
- Analysts' forward-looking one-year estimates for the MSCI ACWI ex USA index sales and earnings per share growth are 3.0% and 0.8% respectively.
- Go-forward returns for the MSCI ACWI ex USA index on an annualized basis are estimated at 8.7%. This rate is based on the current price and actual fundamentals over multiple periods to remove fundamental variability, and better estimate the earnings power of the index.
- A ten-year blended international government yield of 3.1% implies an international equity risk premium of 5.6%. The equity risk premium contracted by 0.4% in the quarter due to a 0.1% increase in long-term government interest rates and a 0.3% decline in the forward-looking returns of international stocks.

Conclusion

International stock market fundamentals are slowing towards a more normal rate of growth. Global government bond yields have moved higher but remain near all-time lows. As stock markets lap their year-over-year fundamental comparisons, the question becomes what multiples investors are willing to pay if the growth projections moderate or even decline.

International stocks are expected to grow earnings per share by 3.0% in the next twelve months. The market trades at 13.3x price to earnings which is below its twenty-three-year average of 16.0x but questions remain if earnings will be impacted by higher interest rates and inflation. The annualized go-forward return of 8.7% is still a widespread relative to global risk-free rates. To capture the spread to bonds, international stock investors will need a long investment horizon as the short-term environment may experience increased volatility.

SMRS

International Equity Strategies

12/31/22

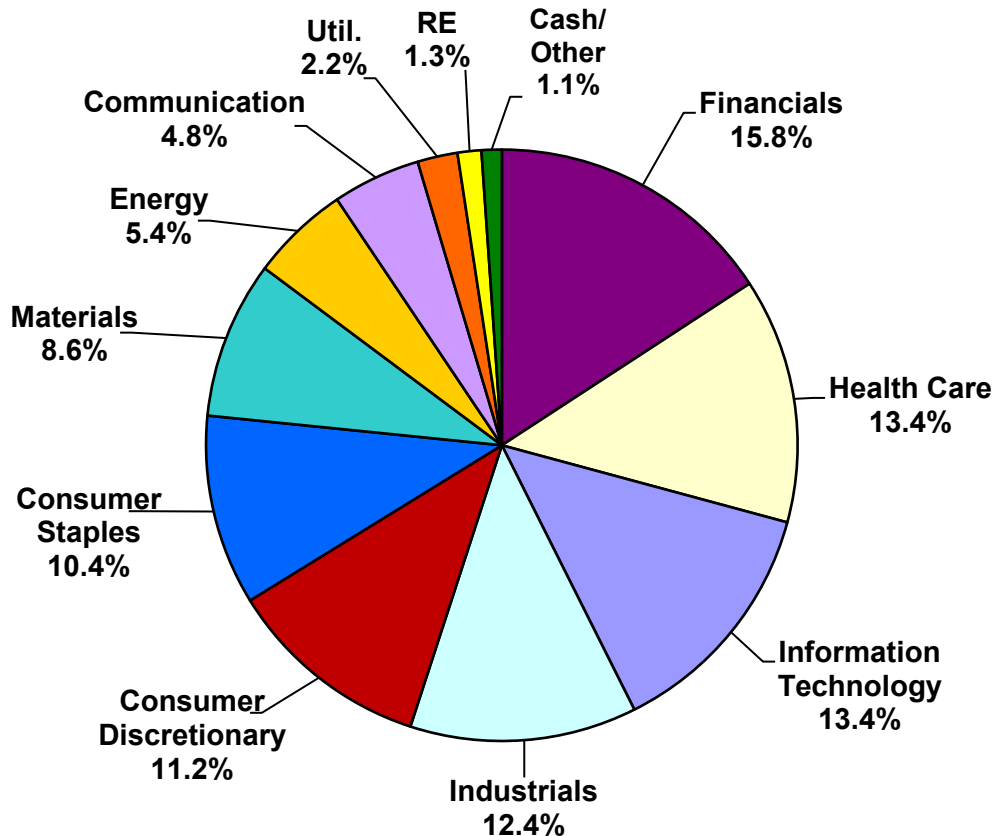
Markets	Amount	Total	% of Total
Active (\$ in Millions)			
BlackRock MSCI	\$2,240		
IED Quality Equity	906		
Martin Currie	413		
UBS	154		
WCM	143		
Wellington	139		
Brown	104		
Vontobel	93		
Baillie Gifford	93		
Morgan Stanley	73		
Baron	43		
Total Active*		\$4,537	36.0%
Stock Plus			
Internal	\$3,060		
PIMCO	2,003		
Total Stock Plus		\$5,063	40.1%
Indexed			
SSGA	\$1,572		
BlackRock	1,450		
Total Indexed		\$3,022	23.9%
TOTAL		<u>\$12,622</u>	<u>100.0%</u>

*Includes transition cash and cash from closed accounts, a total of \$135,929,173

SMRS

International Equity By Sector

12/31/22



Market Value in Millions				
12/31/22				
	Assets	Percent	Benchmark	Difference
Financials	\$1,991	15.8%	21.0%	-5.2%
Health Care	1,695	13.4%	9.8%	3.6%
Information Technology	1,693	13.4%	10.7%	2.7%
Industrials	1,560	12.4%	12.3%	0.1%
Consumer Discretionary	1,411	11.2%	11.3%	-0.1%
Consumer Staples	1,315	10.4%	8.9%	1.5%
Materials	1,092	8.6%	8.4%	0.2%
Energy	679	5.4%	6.0%	-0.6%
Communication Services	604	4.8%	5.9%	-1.1%
Utilities	284	2.2%	3.4%	-1.2%
Real Estate	163	1.3%	2.3%	-1.0%
Total Investments	\$12,487	98.9%	100.0%	
Cash/Other	135	1.1%	0.0%	1.1%
Total	\$12,622	100.0%	100.0%	

Benchmark: MSCI ACWI ex USA

SMRS

International Equities Composite

12/31/22

Date:	<u>12/31/22</u>	<u>9/30/22</u>	<u>6/30/22</u>	<u>3/31/22</u>
Assets (\$ in Millions):	\$12,622	\$11,105	\$12,519	\$14,699
Number of Securities:	2,398	2,436	2,432	2,467
Active Share:	34%	34%	34%	34%

Benchmark: MSCI ACWI ex USA

Description: The International Equities Composite represents all International Equity Division investments.

Portfolio Characteristics:

	SMRS		MSCI ACWI ex USA	
	<u>LTM</u>	<u>Normalized</u>	<u>LTM</u>	<u>Normalized</u>
Return:				
Annualized Total Return	12.3%	10.0%	10.0%	8.7%
Sustainable Growth Rate	7.0%	6.3%	5.8%	6.0%
Dividend Yield	3.6%	2.7%	3.2%	2.6%
Buyback Yield	1.1%	0.3%	1.0%	0.2%
Collateral Yield	0.6%	0.6%	--	--
Risk:				
Beta	1.08	--	1.00	--
Volatility	19.2%	--	17.8%	--
Tracking Error	2.5%	--	0.0%	--
Information Ratio	1.0	0.5	--	--
Fundamental:				
Average Capitalization (\$ in Billions)	82.6	--	77.6	--
Price/Earnings	11.2	15.4	13.3	16.9
Price/Book	1.7	1.8	1.7	1.9
ROE	14.8%	11.6%	13.1%	11.2%

TOP TEN HOLDINGS

(\$ in Billions* - \$ in Millions**)

	<u>Portfolio Weight</u>	<u>Market Capitalization*</u>	<u>FY1 P/E</u>	<u>Market Value**</u>
Novo Nordisk A/S Class B	2.0%	\$234.6	38.5	\$252.5
ASML Holding NV	1.9%	216.8	36.1	238.0
Nestle S.A.	1.6%	318.5	22.4	201.8
Taiwan Semiconductor Manufacturing Co., Ltd.	1.6%	378.4	11.5	201.6
Roche Holding Ltd. Dividend Right Cert.	1.4%	261.9	14.0	171.0
BHP Group, Ltd.	1.3%	156.8	10.6	160.4
Novartis AG	1.3%	217.2	15.0	158.1
LVMH Moet Hennessy Louis Vuitton SE	1.2%	365.2	23.3	147.4
Samsung Electronics Co., Ltd.	1.1%	293.9	9.9	133.8
British American Tobacco p.l.c.	<u>0.9%</u>	<u>88.3</u>	8.9	<u>117.7</u>
TOTAL	<u>14.1%</u>	<u>\$2,531.4</u>		<u>\$1,782.4</u>

International Equity Performance - Net of Fees

12/31/22

<u>Fund Name</u>	<u>Market Value</u>	<u>1-Yr</u>	<u>3-Yrs</u>	<u>5-Yrs</u>	<u>7-Yrs</u>	<u>Incept.</u>	<u>Incept. Date</u>
Total International Equity	\$12,622,263,277	-19.4%	-0.2%	0.9%	4.9%	5.4%	1/1/04
MSCI ACWI ex USA		-16.0%	0.1%	0.9%	4.8%	5.2%	
Lipper Int'l Multi-Cap Core		-14.7%	0.6%	1.2%	4.5%	4.9%	
<i>Excess Return</i>		<i>-3.4%</i>	<i>-0.3%</i>	<i>0.0%</i>	<i>0.1%</i>	<i>0.2%</i>	
<i>Pct Rank vs. Lipper Int'l Multi-Cap Core</i>		<i>95</i>	<i>72</i>	<i>62</i>	<i>35</i>	<i>36</i>	

Total International Active Strategy***	\$4,536,845,822	-22.1%	-0.7%	0.1%	3.9%	4.2%	5/1/05
MSCI ACWI ex USA		-16.0%	0.1%	0.9%	4.8%	4.6%	
Lipper Int'l Multi-Cap Core		-14.7%	0.6%	1.2%	4.5%	4.4%	
<i>Excess Return</i>		<i>-6.1%</i>	<i>-0.8%</i>	<i>-0.7%</i>	<i>-0.9%</i>	<i>-0.4%</i>	
<i>Pct Rank vs Lipper Int'l Multi-Cap Core</i>		<i>99</i>	<i>82</i>	<i>85</i>	<i>78</i>	<i>67</i>	

BlackRock MSCI Systematic Return	2,239,904,853	-16.3%	2.0%	--	--	5.9%	12/1/18
MSCI ACWI ex USA		-16.0%	0.1%	--	--	3.8%	
Lipper Int'l Multi-Cap Core		-14.7%	0.6%	--	--	4.0%	
<i>Excess Return</i>		<i>-0.3%</i>	<i>1.9%</i>	<i>--</i>	<i>--</i>	<i>2.2%</i>	
<i>Pct Rank vs Lipper Int'l Multi-Cap Core</i>		<i>72</i>	<i>13</i>	<i>--</i>	<i>--</i>	<i>9</i>	

IED Quality Equity*	905,679,046	-25.4%	--	--	--	2.5%	2/1/20
MSCI ACWI ex USA		-16.0%	--	--	--	1.0%	
Lipper Int'l Multi-Cap Core		-14.7%	--	--	--	1.5%	
<i>Excess Return</i>		<i>-9.4%</i>	<i>--</i>	<i>--</i>	<i>--</i>	<i>1.4%</i>	
<i>Pct Rank vs Lipper Int'l Multi-Cap Core</i>		<i>100</i>	<i>--</i>	<i>--</i>	<i>--</i>	<i>23</i>	

Martin Currie International Long-Term	413,362,433	-31.3%	1.1%	4.2%	--	7.0%	2/1/17
MSCI ACWI ex USA		-16.0%	0.1%	0.9%	--	4.3%	
Lipper Int'l Multi-Cap Core		-14.7%	0.6%	1.2%	--	4.4%	
<i>Excess Return</i>		<i>-15.3%</i>	<i>1.0%</i>	<i>3.3%</i>	<i>--</i>	<i>2.7%</i>	
<i>Pct Rank vs Lipper Int'l Multi-Cap Core</i>		<i>100</i>	<i>100</i>	<i>100</i>	<i>--</i>	<i>4</i>	

UBS China A Opportunity Fund	154,419,757	-26.5%	--	--	--	-1.0%	5/1/20
MSCI China On shore		-23.5%	--	--	--	3.5%	
Lipper Emerging Markets		-21.1%	--	--	--	4.2%	
<i>Excess Return</i>		<i>-3.0%</i>	<i>--</i>	<i>--</i>	<i>--</i>	<i>-4.5%</i>	
<i>Pct Rank vs. Lipper Emerging Markets</i>		<i>83</i>	<i>--</i>	<i>--</i>	<i>--</i>	<i>93</i>	

<u>Fund Name</u>	<u>Market Value</u>	<u>1-Yr</u>	<u>3-Yrs</u>	<u>5-Yrs</u>	<u>7-Yrs</u>	<u>Incept.</u>	<u>Incept. Date</u>
WCM Focused Growth International	143,023,020	-28.6%	--	--	--	-19.8%	10/1/21
MSCI ACWI ex USA		-16.0%	--	--	--	-11.8%	
Lipper Int'l Lg-Cap Core		-14.7%	--	--	--	-10.3%	
<i>Excess Return</i>		-12.6%	--	--	--	-8.0%	
<i>Pct Rank vs Lipper Int'l Lg-Cap Core</i>		100	--	--	--	100	
Wellington Select China Equity	138,543,368	-30.2%	3.3%	--	--	4.4%	9/1/19
MSCI China On shore		-23.5%	-3.8%	--	--	3.5%	
Lipper Emerging Markets		-21.1%	-3.2%	--	--	0.5%	
<i>Excess Return</i>		-6.7%	7.1%	--	--	0.9%	
<i>Pct Rand vs Lipper Emerging Markets</i>		92	92	--	--	18	
Brown Capital Int'l Small Company Fund	104,363,788	--	--	--	--	-15.4%	3/1/22
MSCI ACWI ex USD		--	--	--	--	-11.0%	
Lipper Int'l Lg-Cap Core		--	--	--	--	-9.2%	
<i>Excess Return</i>		--	--	--	--	-4.4%	
<i>Pct Rank vs. Lipper Int'l Lg-Cap Core</i>		--	--	--	--	0	
Baillie Gifford Int'l Concentrated Growth	92,840,267	-39.8%	--	--	--	-37.6%	12/1/21
MSCI ACWI ex USA		-16.0%	--	--	--	-14.3%	
Lipper Int'l Lg-Cap Core		-14.7%	--	--	--	-12.9%	
<i>Excess Return</i>		-23.8%	--	--	--	-23.3%	
<i>Pct Rank vs. Lipper Int'l Lg-Cap Core</i>		0	--	--	--	0	
Vontobel International Quality Growth Fund	92,682,253	--	--	--	--	-5.3%	5/1/22
MSCI ACWI ex USD		--	--	--	--	-5.2%	
Lipper Int'l Lg-Cap Core		--	--	--	--	-3.3%	
<i>Excess Return</i>		--	--	--	--	-0.1%	
<i>Pct Rank vs Lipper Int'l Lg-Cap Core</i>		--	--	--	--	0	
Morgan Stanley Int'l Opportunity Fund	73,050,866	--	--	--	--	-34.7%	2/1/22
MSCI ACWI ex USA		--	--	--	--	-12.8%	
Lipper International Large-Cap Core		--	--	--	--	-11.7%	
<i>Excess Return</i>		--	--	--	--	-21.9%	
<i>Pct Rank vs Lipper Int'l Lg-Cap Core</i>		--	--	--	--	0	

<u>Fund Name</u>	<u>Market Value</u>	<u>1-Yr</u>	<u>3-Yrs</u>	<u>5-Yrs</u>	<u>7-Yrs</u>	<u>Incept.</u>	<u>Incept. Date</u>
Baron Global Advantage	43,046,999	-51.0%	--	--	--	-48.5%	1/1/22
MSCI ACWI ex USA		-16.0%	--	--	--	-11.6%	
Lipper Int'l Lg-Cap Core		-14.7%	--	--	--	-10.2%	
<i>Excess Return</i>		-35.0%	--	--	--	-36.9%	
<i>Pct Rank vs Lipper Int'l Lg-Cap Core</i>		0	--	--	--	0	

Total International Stock Plus Strategy**	\$5,063,312,410	-18.8%	-0.2%	1.5%	5.7%	6.1%	1/1/09
MSCI ACWI ex USA		-16.0%	0.1%	0.9%	4.8%	6.1%	
Lipper Int'l Multi-Cap Core		-14.7%	0.6%	1.2%	4.5%	6.3%	
<i>Excess Return</i>		-2.8%	-0.3%	0.7%	0.9%	0.0%	
<i>Pct Rank vs Lipper Int'l Multi-Cap Core</i>		93	71	31	9	52	
Internal Stock Plus	3,060,375,820	-18.5%	-0.9%	1.6%	5.1%	4.5%	9/1/11
MSCI ACWI ex USA		-16.0%	0.1%	0.9%	4.8%	4.0%	
Lipper Int'l Multi-Cap Core		-14.7%	0.6%	1.2%	4.5%	4.9%	
<i>Excess Return</i>		-2.5%	-1.0%	0.7%	0.3%	0.5%	
<i>Pct Rank vs Lipper Int'l Multi-Cap Core</i>		91	83	31	21	61	
PIMCO StocksPLUS	2,002,936,590	-19.3%	0.8%	--	--	3.8%	4/1/19
MSCI ACWI ex USA		-16.0%	0.1%	--	--	2.7%	
Lipper Int'l Multi-Cap Core		-14.7%	0.6%	--	--	3.1%	
<i>Excess Return</i>		-3.3%	0.7%	--	--	1.2%	
<i>Pct Rank vs Lipper Int'l Multi-Cap Core</i>		95	49	--	--	29	

Total International Index Strategy	\$3,022,105,045	-15.8%	0.4%	1.6%	5.5%	6.3%	7/1/09
MSCI ACWI ex USA		-16.0%	0.1%	0.9%	4.8%	5.3%	
Lipper Int'l Multi-Cap Core		-14.7%	0.6%	1.2%	4.5%	5.9%	
<i>Excess Return</i>		0.2%	0.3%	0.7%	0.7%	1.0%	
<i>Pct Rank vs Lipper Int'l Multi-Cap Core</i>		61	55	33	12	24	
SSGA MSCI ACWI ex USA Index	1,572,490,369	-15.8%	0.5%	1.2%	--	1.7%	11/1/17
MSCI ACWI ex USA		-15.6%	0.5%	0.9%	--	1.9%	
Lipper Int'l Multi-Cap Core		-14.7%	0.6%	1.2%	--	1.6%	
<i>Excess Return</i>		-0.2%	0.0%	0.3%	--	-0.2%	
<i>Pct Rank vs Lipper Int'l Multi-Cap Core</i>		62	54	49	--	44	

<u>Fund Name</u>	<u>Market Value</u>	<u>1-Yr</u>	<u>3-Yrs</u>	<u>5-Yrs</u>	<u>7-Yrs</u>	<u>Incept.</u>	<u>Incept. Date</u>
Blackrock ACWI ex USA Index	1,449,614,676	-15.7%	0.3%	--	--	1.0%	3/1/18
MSCI ACWI ex USA		-15.6%	0.5%	--	--	1.3%	
Lipper Int'l Multi-Cap Core		-14.7%	0.6%	--	--	1.2%	
<i>Excess Return</i>		<i>-0.1%</i>	<i>-0.2%</i>	--	--	<i>-0.2%</i>	
<i>Pct Rank vs Lipper Int'l Multi-Cap Core</i>		<i>60</i>	<i>56</i>	--	--	<i>54</i>	

* The total includes the cash balance of closed funds, a total of \$135,929,173

Disclaimer



This presentation was given solely for the purpose of explaining the structure, investment process, and returns for the State of Michigan Retirement System. It should not be interpreted in any way as financial advice.